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Vol. XVIII

No. 6

Contractors and Engineers Monthly

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1929

Well-Hole Blasting Necessary to Remove Tough Shale Knob on State Road Job

48 Holes Loaded with 60 Per Cent Gelatine in Series of 6 Holes Moves 10,000 Tons of Rock with Each Blast of 1½-Tons of Explosives



IVE hundred feet of tough shale, which has stood since the days of the American Revolution as a bar to traffic on the Albany Post Road going through Peekskill, on Route 9E from New York City, is now being removed by the Westchester Construction Co., Yonkers, N. Y. The

wedge of rock which is being removed is approximately 46 feet wide at the bottom, 90 feet wide at the top of the rock, 120 feet wide at the top of the earth and runs from 90 to 98 feet deep. The rock is a tough Hudson River shale having a sharp slope toward the south which materially adds to the difficulties in the blasting operations.

The contractor has attacked this north and south cut from the two ends. On the south end the first 150 feet was a sandy gravel which was readily handled by a Marion shovel loading into motor trucks. Beyond this point was the tough shale which necessitated a complete change in excavation methods.

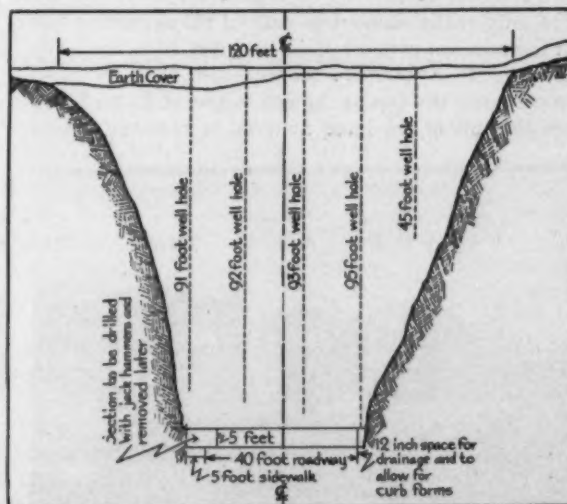
WORK ON NORTH FACE

Most of the north cut was rock from the start which has been removed in 12-foot benches by jackhammers operated by Schramm portable compressors. A P.&H. gas shovel was used in the general excavation on the north side of the cut. From the point where the rock face was sufficiently high for well hole blasting, a Sanderson-Cyclone well drill and a Clipper drill mounted on a Mack truck were used to drill the holes which were cased with 6-inch pipe in the upper section through the few feet of overlying dirt. The contractor built about a thousand feet of service road from the base of the knob to permit hauling and transporting supplies.

At about the middle of well-hole drilling operations the engine operating the Clipper drill failed and as parts

could not be purchased locally and the shipping delay would have been serious, an old Overland sedan was purchased, driven to the top of the cut over the service road, the engine removed and mounted on the driller.

On the north cut when the first well holes were driven, it was necessary to crib out over the sloping earth that the well hole driller might handle its operations successfully. Since the well holes are good for only 25-foot face blasts, the holes were spaced 6 across the cut approximately as shown in the accompanying diagram, which shows a section about 100 feet in from the south end, and at 25-foot intervals longitudinally through the cut. Because of the slope of the shale, the toe of the south cut could not be blasted out successfully and had to be removed each time by jackhammer drilling in order to clear the space and make it possible for the



A Section Approximately 100 Feet in From the South Face of the Rock Cut at Peekskill, N. Y., on New York State Highway Route 9-E



Marion shovel to get close enough to the face to quickly remove the shattered rock. The slope of the shale also furnished another peculiarity in the blasting in that the rock invariably broke back from the line of holes being exploded to the next line of holes. This frequently left some of the holes virtually stranded out on the sloping face and in more than one instance, it was necessary for the man loading the holes to climb out on a ladder to insert the 5 x 16-inch 60 per cent gelatine Hercules dynamite in the holes.

Water was usually struck about 10 to 30 feet below the surface. Since this knob is not close to any regular water supply, each hole was started with water from preceding holes removed with a dart baler into a large metal barrel and then run into the new hole.

REMOVAL OF LOOSE ROCK FROM SIDES OF CUT

The only really dangerous part of the operation has been the removal of loose stone and dirt from the walls of the cut. It is necessary for workmen to be let down by ropes from the top of the cut to use picks and bars to see that all of the loose material is removed before

the men enter the cut to clean up after a blast.

PAVING AND BRIDGE INCLUDED IN THIS CONTRACT

The removal of this large shale knob is only a portion of the contract which the Westchester Construction Co., is handling in this section. The contract calls for the construction of a standard New York State concrete pavement connecting a completed pavement to the south and a new concrete highway over Sprout Brook and then a short section of concrete to connect with the job completed two years ago by Lowell Grossman & Co., Poughkeepsie, N. Y., and described in the April, 1928, issue of *CONTRACTORS AND ENGINEERS MONTHLY*.

PERSONNEL

The work is being done by the Westchester Construction Co., Yonkers, N. Y., with R. O. Weston as Superintendent under the direction of J. S. Bixby, District Engineer, Division of Highways, New York State Dept. of Public Works, with E. H. Carlson as Assistant Engineer in charge. S. Arthur Johnson of the New York Office of the Hercules Powder Co., assisted in the loading of the well holes for blasting.



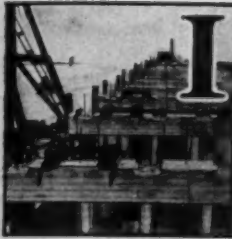
South Face of the Cut Soon After Rock Was Encountered



Firing the Third Blast on the Cut on December 14, 1928

Construction Plant and Methods for Concrete Bridges

*A Complete Outline Covering a Broad Field of Operation
In Concrete Culvert and Bridge Construction
With Deep or Shallow Foundations*



IN attacking his problem, as to plant and methods, the concrete bridge builder must consider:

- (a) The character and quantity of units of work involved.
- (b) The time allowed to do the work.
- (c) The characteristics of the site.
- (d) The history of the stream and the meteorological records.
- (e) The supervisory and executive staff he has available for the work in hand.
- (f) The available labor and mechanics.
- (g) The sources of supply of materials and the probable continuity or dispatch with which they may be secured.
- (h) The safety of men.

Inasmuch as plant and methods vary widely, depending on the character of foundations, this study will be developed under the following outline:

1. Concrete viaducts (with little or no water problem.)
2. Concrete bridges, having shallow foundations to rock or foundations resting on pile underpinning.
3. Concrete bridges, having deep foundations where work under air is required.

THE METHOD OF ATTACK

This is perhaps the first thing to be settled. The bridge builder may begin work at either end of his structure or in the middle or combine these alternatives. The characteristics of the site will probably dictate whether he will start at the point nearest his plant and material storage yards, complete that to a certain stage, and then work over it to continue his operation of completing the remainder of the structure; or whether he will begin at the most remote point and work toward his plant. The difficulty, or lack of difficulty, of constructing and maintaining a temporary trestle, or crossing, might influence that decision.

For bridges over water the necessity of maintaining an open channel for navigation is a factor in arriving at the method of attack. A turbulent stream, or a fluctuating water level might dictate the advisability of doing certain parts of the work in a favorable season of the year, and carrying on other parts, less affected by seasonal changes, when opportunity permits.

The method of attack must necessarily be based on some reasonable assumption as to stream performance. The stream may not perform as was expected from scrutinizing a 20-year history; the weather conditions may cut down or extend the length of the building season;

the foundation shown on plans to rest on rock at Elevation 710 may have to be sunk to Elevation 685, requiring a change in method and loss of time—any of these will probably happen, and many others may happen. So the method of attack will be influenced accordingly.

Although plans made as to the order in which the work will be carried out may suffer reversal, and although parts of the work may require more time, or less time, than anticipated, yet it is advisable to prepare in advance of starting work a "progress schedule."

A PROGRESS SCHEDULE

Such a schedule is the result of dividing the work to be done by the time allowed. Plant and method must be made to harmonize with the progress schedule, and the wise builder will leave some margin for what he cannot control. Units of work in different sections should be shown on the progress schedule, and beside them should be set down the length of time required for each such operation. It is well to plot the whole performance on a chart, with time as ordinates, and items of work as abscissas. In this way, interference by seasoned floods, or cold weather, becomes easily apparent.

In all probability the original expectation of performance will have to be modified due to causes enumerated, or other causes of which no one has ever heard. If the departure from expectation is a material one, it becomes advisable to take stock of what is done to date, what remains to be done, and the time remaining in which to do the work; and then to make a new progress schedule. A progress schedule should be a guide for that part of the bridge builder's organization which buys materials and arranges delivery.

CHOICE OF EQUIPMENT

Generally, the size of equipment, or the number of equipment units, will develop from a consideration of the practical average output per hour, of the hours per day worked, of the number of days allowed, and of the amount of work to be done. Builders are much more nearly in accord as to the amount of plant than as to the type most suitable to secure progress and economy.

Comparative plant layouts should be studied by considering the cost of use as set down in the "Plant Rental Schedule of the Associated General Contractors of America." A layout capable of wonderful performance might be economically unsound, when the cost of its use is considered either with respect to the units of work involved, or some less expensive, but adequate plant.

A general outline of items which appear pertinent in a discussion of plant and methods for concrete bridges is given below:

DEVELOPMENT OF SITE FOR WORK

Easements and right of way.

Roads.	Temporary buildings:
Tracks.	Offices.
Water supply.	Tool rooms.
Power:	Shop.
Electric motors and power lines.	Saw-mill.
Steam.	Lunch shelter.
Gas.	Camps.
Diesel.	Transportation of men
Light and wiring.	Storage space for:
Compressed air.	Lumber.
	Timbers.
	Piling.
	Steel.
	Miscellaneous supplies.
	Concrete materials.
	Unloading equipment.

VIADUCTS

The typical operations for which a plant is required for viaducts are as follows:

Excavation:	Pumping:
Earth, dry.	(The influence of "pay lines," shoring, and the several kinds of excavating machinery available will be discussed in more detail in the final report.)
Earth, wet.	
Rock, solid—dry.	
Rock, solid—wet.	
Rock, loose.	
Pile-Driving:	Shoring (But not including forms):
Of wood piles.	Steel Centering:
Of concrete piles.	Trusses.
With swing drivers.	Arches.
With skid drivers.	Wood Centering:
With drop-hammers.	(Should be discussed as to selection of type for specific purposes.)
With steam-hammers.	
With jetting-hammers.	Transportation to Place:
Concrete Mixing:	Towers and chutes.
Aggregate storage and reclamation.	Locomotives and cars.
Cement storage.	Cableways.
Mixer bins.	Carts.
Batching:	Placing:
(1) Volume.	Bottom dump buckets.
(2) Weight.	Buggies.
Water measuring.	Tremies.
Mixers.	Spading.
	Movable hoist towers.

It would appear that the consideration of a concrete plant for bridges would lead to a discussion of such things as are required for production in large volume and continuously, this as differentiated from plants for concrete buildings.

CONCRETE BRIDGES HAVING SHALLOW SUB-AQUEOUS FOUNDATIONS

The typical operations for which a plant is required in this case are:

Excavation:	Coffer Dams:	Floating Equipm't:
Dredging.	Earth dike.	Barges.
Clamshells.	Crib.	Derrick scows.
Shovels.	Wood-sheeting.	Pile-driverscows.

Draglines. Steel-piles. Trestles. Pumping.

CONCRETE BRIDGES HAVING DEEP FOUNDATIONS, WHERE WORK IS UNDER AIR

The typical operations for which a plant is required in such bridges are:

Air locks.	Sinking methods.
Air supply.	Excavation:
Cutting edges.	Buckets.
Caisson shafts:	Hoists.
Wood.	Placing of Concrete:
Steel.	Plant and methods.
Concrete.	

This report made by Donald B. Fegles, General Manager, Fegles Construction Co., Ltd., Minneapolis, Minn., Chairman, and Edward H. Connor, Vice-President and Chief Engineer, Missouri Valley Bridge & Iron Co., Leavenworth, Kans., is to be expanded in the final report to include safety measures, legal regulation of conduct of work and storage and rehabilitation of plant. The report as published in the March, 1929, *Proceedings of the American Society of Civil Engineers*, makes a valuable contribution to construction literature.



Laying a Cement Floor at Night by the Use of Acetylene Flares

Lights for Emergency Work

THE use of a portable acetylene light as an emergency measure is by no means confined to fire departments, wrecking crews or similar organizations. Due to the present industrial expansion there is need today for such lighting facilities in many industries. Road contractors find the portable light a handy aid in night work where contracts must be completed rapidly or where a bonus depends upon finishing the job within a certain specified time. Excavating contractors keep their steam shovels busy on twenty-four hour schedule by means of portable flood lights, as it has been found that loaded trucks can make better time at night through deserted city streets. Many building contractors use the portable light on work which precedes the installation of electric wiring in the building. Such work as laying a cement floor at street level, as is shown in the accompanying illustration, or jobs undertaken while the steel frame work is still progressing skyward may be carried on with the use of such flood lights.

These systems make for speed and efficiency, as with them every possible hour can be utilized on the job.

Watch Out for Depreciation

*Like "Death and Taxes" This One Item Will Wreck
Your Finances Unless You Protect Yourself
Properly by Charging for It*



MODERN road construction is a product of the last quarter of a century. Road types and methods have changed materially in that time. In the early days, before the advent of rigid type pavements, the equipment used upon a construction project represented only a small portion of the

cost of the work. After the war the labor shortage became acute and the amount of machinery used in the construction of pavements increased rapidly. With the increased cost of labor, equipment was invented to reduce the amount of labor, and increase production.

Many contractors did not realize that replacement of equipment must be carried by the job or the units of work performed and found that their total assets at the end of a season or two consisted of equipment, the greater part of which was obsolete. The directors of the American Road Builders Association, realizing the situation which had previously existed, appointed a committee on depreciation of contractors' equipment, headed by W. A. Van Duzer, Deputy Engineering Executive, State Department of Highways, Harrisburg, Pa., on whose report this discussion is based.

THREE PRINCIPLES SET UP

As the basis for the report of the Committee on Depreciation three principles were set up.

1. To have the information so that fair rental rates might be set up by the contractor for his equipment for use in connection with cost-plus-a-fee contracts; such rental rates, however, not to include profit. If a profit on the equipment is to be added, an adjustment of the rate will be necessary. Also that the contractor might set up a rental rate to use on contract work so that sufficient money will be set aside to pay for the depreciation, interest, insurance and operation of the equipment.

2. To give public officials information on the value of machines, so that they may evaluate the list of plants submitted with the bidder's questionnaire. Also, to give public officials information for setting up rental rates for equipment owned by the states or their subdivisions, used principally on maintenance work, so that equipment charges will be represented in the cost of the work.

3. To provide information for bankers and others who have credit transactions with the construction company.

In addition to the value of the depreciation schedule to contractors and road officials, there are five branches of the Federal government now working on the subject of depreciation. They are the Interstate Commerce Commission, the Internal Revenue Department, Fed-

eral Power Commission, the Department of Commerce and the Tariff Commission.

DEPRECIATION AND OBSOLESCENCE

An aggregate of improvements over a period of time will make any machine obsolete. This is the particular type of depreciation which is being studied by the Interstate Commerce Commission. Gradual depreciation is really obsolescence.

PROPER RECORDS LACKING

The committee found it very difficult to get accurate information on the subject of depreciation because of the insufficiency of records and it is hard to tell the difference between depreciation and obsolescence. The sub-obsolescence, due to invention, is something nobody can tell about for some time. There will be changes made which are bound to be revolutionary. It was, therefore, necessary to separate the studies between gradual obsolescence which is going on continuously and sub-obsolescence which is changing from one type of equipment to a more suitable one.

ESSENTIALS OF DEPRECIATION

The Bureau of Internal Revenue considered two things to be essential in the study of depreciation. They are: 1, a statement of the useful lives of the depreciable assets of an industry by items or classes of similar items, preferably departmentalized according to the different processes employed, services rendered or products made by the industry. Such a schedule affords the only possible basis of comparison between the diverse methods for depreciation accounting and gives the fundamental information required for the determination of essentially similar depreciation rates, irrespective of the method employed. 2. A statement of the principles and methods of depreciation accounting best suited to the business conditions of the industry to which the results of the study will apply.

A TENTATIVE RENTAL SCHEDULE

The Associated General Contractors of America have been working upon an equipment rental schedule and several years ago published a tentative schedule which has been used to advantage by public officials and contractors. It was felt that the schedule was not complete and so additional studies have been made with the result that a tentative depreciation schedule has been worked out by the Committee of the American Road Builders Association. The variation, in working days, even in different parts of the state, to say nothing of the United States, forces certain adjustments in rental rates. The working days in the United States vary from 120 to 240 days. It is evident that with such a wide range of working days for road construction, a

rental rate applying in the northern part of the United States would not be applicable to those states where the working season is much longer.

METHODS NOW WELL STABILIZED

Up to this time it has been rather difficult to place a depreciation figure upon the majority of road equipment because of the great changes which are taking place almost yearly in the construction industry. Equipment which was considered efficient one year would be discarded the next season because of different methods employed or larger production by the use of other equipment. It is believed that the industry is now sufficiently established so that sub-obsolence, due to the inadequacy of equipment, has been reduced to a minimum. This factor has not been considered in setting up the proposed rental schedule.

FIVE METHODS OF DEPRECIATION

1. The straight line method—a fixed percentage of initial cost charged off as depreciation each year whether or not the equipment is used.
2. The unit of work method—charge off depreciation according to the amount of work done.
3. The job charge-off method—charge off difference between original cost and salable value, at end of job.
4. The composite rate method—combine depreciation of all items of equipment and divide by total investment to get rate to apply each year to equipment as a whole.
5. Appraisal of useful life method—equipment periodically inspected and appraised according to its useful life.

EFFECT OF LENGTH OF WORKING SEASON

In applying the rental schedule the question arises whether the rental rates for the 120-working day season should be twice as much as the rental rates for the 240-day season. Unquestionably, equipment depreciates even if not used, but there is a question whether it depreciates in direct proportion. It would seem that such would be the case and then repairs to the equipment would be the only addition made spread over the total days worked. An arbitrary figure would have to be set up for this item and probably adjustments would be made each year.

If a piece of equipment, say a tractor, cost originally \$5,000 and depreciated at the rate of 20 per cent a year which would be \$1,000, the interest on the initial investment of \$5,000 at 6 per cent would be \$300 per year. The insurance would probably be around \$50 a year, irrespective of how much the equipment is operated. There would be a fixed charge of \$1,350 per year and, if the equipment were operated 120 days, the cost per day would be over \$11, exclusive of repairs and operation costs. If the equipment operated 240 days, there would be a cost of a little over \$5.50 per day for the above named items, but probably an increased cost in repairs.

It would seem fair, therefore, to set up the average year's life for the average equipment giving a straight line depreciation.

The accompanying tables show the number of working days upon which grading can be done by states, the working time upon which pavement can be laid by states, the geographical number of working days upon

which grading can be done and geographically the number of days pavement can be laid in the United States.

NUMBER OF WORKING DAYS PER YEAR UPON WHICH GRADING MAY BE DONE (EXCLUSIVE OF SUNDAYS, HOLIDAYS and BAD WEATHER)

State	Days	State	Days
Alabama	240	Nebraska	250
Arizona	200-300	Nevada	240-300
Arkansas	300	New Hampshire	140
California	155-300	New Jersey	190
Colorado	180-210	New Mexico	160
Connecticut	220	New York	160
Delaware	220	North Carolina	200
Florida	240	North Dakota	150
Georgia	300	Ohio	
Idaho	120-200	Oklahoma	225-240
Illinois	180-240	Oregon	190
Indiana	160-175	Pennsylvania	190-200
Iowa	175	Rhode Island	210-240
Kansas	220	South Carolina	130-165
Kentucky	175	South Dakota	190
Louisiana	225	Tennessee	240-300
Maine	140	Texas	170-180
Maryland	180-240	Vermont	155
Massachusetts	225	Virginia	180-210
Michigan	180	Washington	180-300
Minnesota	150	West Virginia	140-150
Mississippi	240	Wisconsin	300
Missouri		Wyoming	
Montana			

Data not received where blanks are shown.

WORKING DAYS PER YEAR UPON WHICH PAVING CAN BE DONE (EXCLUSIVE OF SUNDAYS, HOLIDAYS and BAD WEATHER)

State	Days	State	Days
Alabama	240-300	Nebraska	225
Arizona	200-300	Nevada	150-175
Arkansas	300	New Hampshire	100
California	120-300	New Jersey	140
Colorado	125-155	New Mexico	140
Connecticut	160	New York	130
Delaware	240 up	North Carolina	200
Georgia	300	North Dakota	180
Idaho	80-120	Ohio	
Illinois	120-135	Oklahoma	225-240
Indiana	120-140	Oregon	120-140
Iowa	125	Pennsylvania	140-150
Kansas	140	Rhode Island	180-240
Kentucky	100	South Carolina	110-140
Louisiana	225	South Dakota	175
Maine	110	Tennessee	180-240
Maryland	140	Texas	170-180
Massachusetts	150	Vermont	115
Michigan	130	Virginia	150-180
Minnesota	160	Washington	150-240
Mississippi	160	West Virginia	120-180
Missouri		Wisconsin	110
Montana	100-120	Wyoming	140-160

Data not received where blanks are shown.

THE A. G. C. DEPRECIATION SCHEDULE

Following is a schedule of equipment depreciation by percentages. Unquestionably, there will be changes in this schedule from time to time, but it is felt that the A. G. C. schedule is a working basis on about 250 pieces of equipment, most of which is used in road construction.

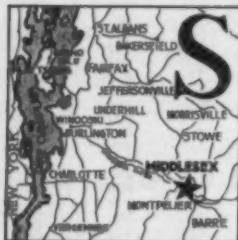
ASSOCIATED GENERAL CONTRACTORS OF AMERICA SCHEDULE OF EQUIPMENT DEPRECIATION AS ACCEPTED BY THE AMERICAN ROAD BUILDERS ASSOCIATION

Items of Equipment	Average Useful Life		Annual Depreciation Percent
	Years	Days Work	
AUTOMOBILES, light	2	460	50
" medium	3	600	33+
" heavy, high grade	4	920	25
BACKFILLERS, light	3	380	33+
" medium	4	505	25
" heavy	5	630	20
BALLAST SPREADER CARS	10	300	10
BARBENDERS	3	530	33+
BARCUTTERS	3	530	33+
BATCHBOXES	3	350	33+
BATCH INUNDATORS	3	305	33+
BATCH MEASURING DEVICES	3	350	33+
BATCHER PLANTS, all steel demountable	4	470	25
" " steel fr., wood bin	4	470	25
" " wood fr., wood bin	2	235	50
BIN FRAMES, steel	5	585	20
BINS, only, steel	5	585	20
" wood	2	235	50
BLACKSMITH SHOP OUTFITS	4	770	25
BOILERS, locomotive	7	700	14+
" upright	7	700	14+
BUCKETS, cable way	4	410	25
" concrete	3	310	33+
" clam-shell	4	445	25
" dragline	4	430	25
" orange peel	4	400	25
BUILDINGS, Job Office, steel standard	3	900	33+
BULLDOZERS, for tractor	2	200	50
BUNKERS, stone portable, with screen	3	345	33+
CABLEWAYS, cable only	3	395	33+
CABLEWAY CARRIAGES	5	660	20
CABLEWAY TOWERS, steel	4	530	25
" wood	2	265	50
CARS, batch box, steel	4	470	25
" boarding and tool	7	1260	14+
" concrete	4	410	25
" dump, steel	7	820	14+

Items of Equipment	Average Useful Life		Annual Depreciation Percent	Items of Equipment	Average Useful Life		Annual Depreciation Percent
	Years	Days Work			Years	Days Work	
" " wood	5	585	20	" " medium	3	375	33+
" " flat, steel	8	1150	12½	" " heavy	4	500	25
" " wood	6	865	17	" " steam	5	550	20
" " hopper, steel	9	800	11+	Paving, gas (21-E obsolete)	4	450	25
CARTS, concrete	3	250	33+	" " steam (21-E size obsolete)	4	500	25
CHANNELERS, rock machine	4	350	25	Truck mounted units	3	360	33+
CONCRETE MACHINES, pneumatic	4	280	25	MIXERS, mortar, portable	3	390	33+
COMPRESSORS, motor truck unit	5	570	20	MOTORS, electric, medium	5	480	25
" " portable, electric	6	630	17	" " large	6	600	20
" " " gas	4	420	25	MOWERS, right of way	3	720	17
" " " steam	6	630	17	OILERS, road, tank wagon, steel	3	350	33+
CONCRETE SPOUTING EQUIPMENT				PILE DRIVERS, steam outfit on skids	6	700	17
Concrete buckets	3	310	33+	" " railroad outfits	6	600	17
Hoppers	3	310	33+	PILE HAMMERS, steam or air, light	10	650	10
Spouts and chutes	2	210	50	" " " " medium	3	270	33+
Towers, steel boom and counterweight	5	580	20	" " " " heavy	5	450	20
Tower spouting plant complete	4	415	25	PIPE, galvanized	7	560	14+
CONVEYORS, elevating, belt, portable	3	250	33+	" " black	4	460	25
" " elevating, belt, stationary	4	350	25	PLOWS, furrow or roter	4	460	25
CRANES, motor truck, mounted	4	430	25	PNEUMATIC TOOLS	3	340	33+
" " crawler, electric, light	5	540	20	Backfill tampers	3	300	33+
" " " medium	6	650	17	Borers, wood	3	300	33+
" " " heavy	8	865	12½	Calking and chip ing hammers	3	300	33+
" " " gas, light	4	480	25	Clay diggers	3	300	33+
" " " medium	5	600	20	Drills, jack hammer	3	330	33+
" " " heavy	6	720	17	Holders-on	4	400	25
" " " steam, light	5	600	20	Pavement breakers	3	300	33+
" " " medium	6	720	17	Riveters	3	300	33+
" " " heavy	8	900	12½	Saws, hand	3	300	33+
" " locomotive, gas	7	850	14+	PUMPING UNITS, portable			
" " steam	10	1240	10	Centrifugal, electric	4	470	25
CRUSHERS, rock portable	4	460	25	" " gas	3	350	33+
" " stationary	6	690	17	Diaphragm, electric	4	470	25
CUTTING AND WELDING OUTFITS				" " gas	3	350	33+
Portable	4	320	25	Piston, electric	4	470	25
DERRICK CARS, bridge, builders complete	10	660	10	" " gas	3	350	33+
DERRICK CRABS, hand	6	720	17	PUMPING UNITS, stationary			
" " power	4	480	25	Centrifugal, electric	5	585	20
" " guy, steel	8	1320	12½	" " gas	4	470	25
" " wood	4	660	25	" " steam	5	585	20
" " hand, circle swing	4	480	25	Piston, electric	5	585	20
" " stiff leg, steel	8	1320	12½	" " gas	4	470	25
DRAG LINES, electric, light	4	660	20	" " steam	5	585	20
" " " medium	6	650	17	PUMPS, only, centrifugal	6	600	17
" " " heavy	8	865	12½	" " impulse	8	720	12½
" " " gas, light	4	480	25	" " piston	6	650	17
" " " medium	5	600	20	RAILS, steel	8	1080	12½
" " " heavy	6	720	17	RIVETERS. (See Pneumatic Tools)			
" " " steam, light	5	600	20	ROLLERS, concrete finishing, steel	5	585	20
" " " medium	6	720	17	" " road, gas	7	800	14+
" " " heavy	8	960	12½	" " steam	9	1100	11+
DRILLS, electric rock	3	320	33+	ROOTER GRADERS, wheel	4	700	20
" " air, tripod	4	400	25	" " " " wood	3	420	33+
" " drifter	3	315	33+	SCARIFIER attachments	2	235	50
" " jack hammer	3	330	33+	SCARIFIERS, drag, all steel	3	350	33+
" " tunnel carriage	5	300	20	" " grader type	3	350	33+
" " well, traction	6	360	17	" " block, steerable	4	470	25
DRILL SHARPENERS, pneumatic	5	660	20	SCRAPERS, fremo	2	260	50
ELECTRIC TOOLS				" " maney	3	300	33+
Boring machines	3	360	33+	" " rotary	2	260	50
Drills, hand	3	360	33+	" " slip	1	150	100
Grinders	3	360	33+	" " wheel	3	360	33+
Hammers	2	240	50	SCREENS AND BUNKERS	3	350	33+
Saws, hand	2	240	50	" " only	3	345	33+
ELEVATORS, bucket, stationary	4	460	25	SHORES, adjustable	3	480	33+
" " cage, steel tower	5	580	20	SHOVELS, crawler or wheel, electric, light	5	540	20
ENGINES, only, gas	5	510	20	" " " " med.	6	650	17
" " oil	5	850	20	" " " " heavy	8	865	12½
" " steam	10	920	10	" " " " gas, light	4	480	25
EXCAVATORS CABLEWAY, complete	3	345	33+	" " " " medium	5	600	20
except power	3	350	33+	" " " " heavy	6	720	17
FINISHING MACHINES	3	350	33+	" " " " steam, light	5	600	20
FLOATS, bridge, steel	4	470	25	" " " " med.	6	720	17
FORMS, steel, curb and gutter	3	420	33+	" " " " heavy	8	960	12½
" " road	3	350	33+	" " " " railroad, steam	9	1080	11+
" " wall	4	300	25	" " " " tunnel	3	300	33+
" " tunnel	2	250	50	STONE SPREADERS, hopper wagon	4	320	25
GIN POLES, steel	2	230	50	" " " " steel box	4	320	25
GRADERS, blade road, light	2	230	50	SUBGRADE. (See Graders), Pile			
" " " medium	3	350	33+	SWITCHES portable	3	360	33+
" " " heavy	5	600	20	SWITCHES, stationary	4	480	25
" " " power, light	2	230	50	TOOL CARTS, steel	4	700	25
" " " medium	3	350	33+	TRACK, industrial, portable	4	600	25
" " " heavy	4	500	25	TRACTORS, very light	2	240	50
" " elevating	4	550	25	" " light	3	350	33+
" " form (subgrader planers)	3	360	33+	" " medium	4	470	25
GRAVEL WASHERS. (See Washers)				" " heavy	5	600	20
HAMMERS, air. (See Pneumatic Tools)				TRAILERS, dump, steel	5	840	20
" " pile. (See Pile Hammers)				" " wood	4	430	25
HOISTING UNITS, chain	5	825	20	" " platform, wood	4	430	25
" " drum, electric	7	900	14+	" " drop platform, heavy duty	5	420	20
" " " gas	5	650	20	TOWERS. (See Elevators and Concrete Equipment)			
" " " steam, w. boiler	8	1020	12½	TRENCHING MACHINES, gas, light	3	300	33+
" " post, electric	4	660	25	" " " " med.	5	500	20
HOISTS, only, drum, no power	10	1650	10	" " " " heavy	7	700	14+
HOISTS, SLEW, steam	10	1650	10	" " " " steam, light	5	500	20
" " electric	5	825	20	" " " " med.	6	600	17
HYDRAULIC GIANTS	7	755	14+	" " " " heavy	8	800	12½
INUNDATORS. (See Batch Inundators)				TRUCKS, general purpose, light	2	375	50
JACKS, hydraulic	6	990	17	" " " " medium	3	480	25
" " screw	5	880	20	" " " " heavy, high gr.	3	750	25
LEAD MELTING FURNACES	5	540	20	" " dump, light	2	235	50
LOADERS, bucket, stationary	6	480	17	" " medium	3	350	33+
" " crawler	4	350	25	" " heavy, high grade	4	470	25
" " portable	5	300	20	TURNABLES, industrial, railway	4	470	25
LOCOMOTIVES, battery	4	500	25	" " truck	3	350	33+
" " gasoline, light	4	470	25	WAGONS, dump, steel	5	600	20
" " " medium	5	585	20	" " wood	4	480	25
" " " heavy	6	700	17	" " farm, heavy	4	480	25
" " steam, industrial, light	7	770	14+	" " light	3	380	33+
" " " med.	8	880	12½	" " tank or sprinkler, steel	5	600	20
" " " heavy	9	990	11+	" " " " wood	3	330	33+
" " " railroad type	12	1225	8+	WAGON LOADERS. (See Loaders)			
MIXERS, concrete, A. G. C. Standard	4	500	25	WASHERS, gravel	3	345	33+
" " Building, electric	4	500	25				
" " gas, light	2	250	50				

Rebuilding An Old Vermont Hydro-Electric Plant

*Wooden Crib Dam in Deep Gorge Swept Out in 1927 Flood
Replaced by Ogee-type Concrete Structure
by Fred T. Ley & Co., Inc.*



EVERE flood conditions throughout Vermont in November, 1927, swept out many miles of road and numerous hydro-electric projects. The wood crib dam of the Green Mountain Power Corp., at Middlesex, Vt., built in 1896, was among the dams that went out. This wood crib dam was approximately 150 feet long and 26 feet high. The power plant proper was located approximately 1,000 feet downstream near the end of the Middlesex Gorge on the Winooski River in Moretown, Vt. This plant was one of the earliest of Vermont's hydro-electric developments and consisted of three water wheels belted to a jack shaft which, in turn, operated two 600-kilowatt generators. The plant proper was not seriously damaged in the flood, but, since it was so obsolete and with large power losses in pulleys, shafting and belts, the Green Mountain Power Corp., decided to rebuild the entire project.

During the winter months of 1927-28, Charles T. Main, Inc., consulting engineers, Boston, Mass., made an intensive study of the gorge and its possibilities for a modern hydro-electric development. Plans were completed by early spring by M. G. Clark, General Manager of the Green Mountain Power Corp., together with W. F. Uhl of Charles T. Main, Inc. The general contract for the dam, pen-stock, power house and incidental

work was awarded to Fred T. Ley & Co., Inc., Springfield, Mass.

DESIGN OF NEW CONSTRUCTION

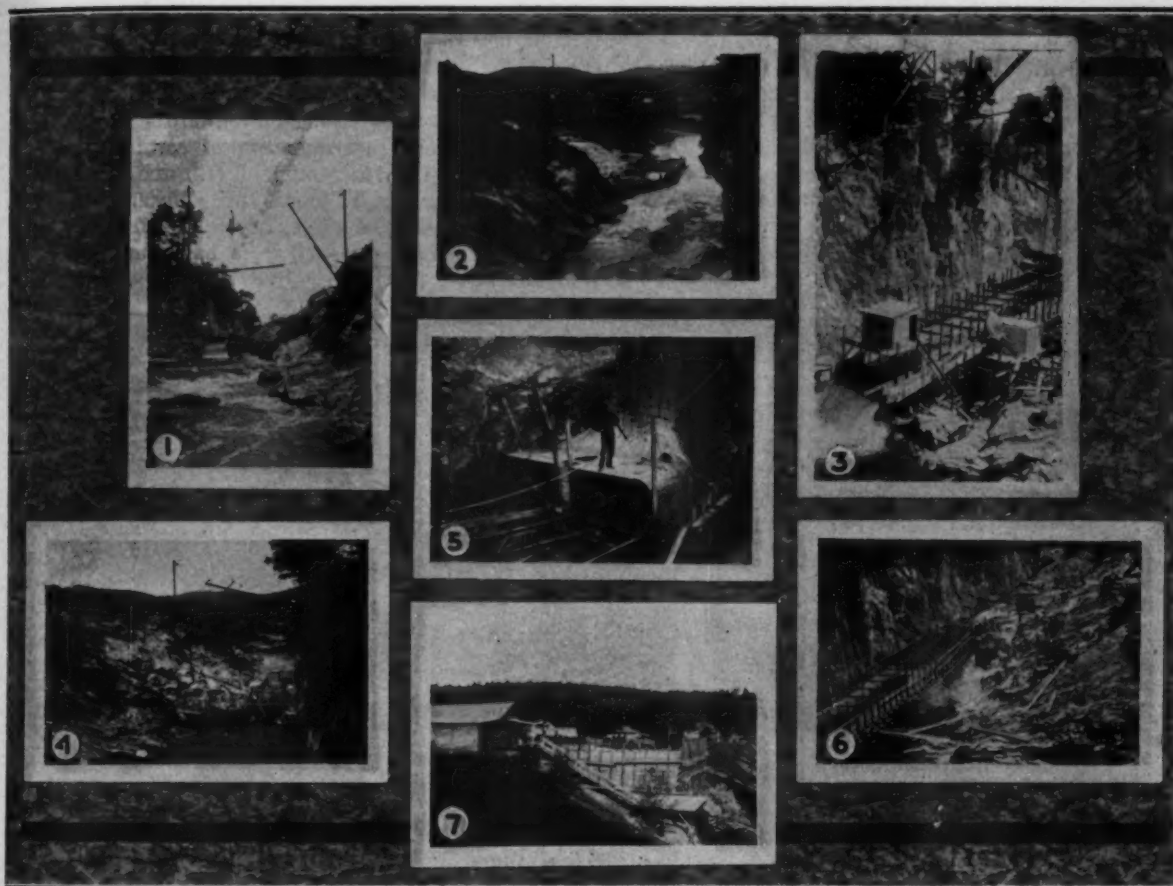
The new dam is of the ogee type and is built entirely of concrete. The section perpendicular to the stream is 85 feet long with a width of 46 feet at the base and a height of 46 feet. At the end of this 85-foot section, the dam turns at an angle of approximately 90 degrees and runs nearly parallel to the stream bed for a distance of 200 feet, making a total spillway of 285 feet. In the main section of the dam are two 9 x 9-foot floodgates operated by electric motors controlled from the gate house mounted on piers 15 feet over the crest of the dam.

The natural topography of the surrounding ledge was used to provide a channel for the water for the new intake. The old channel through solid ledge was utilized and enlarged by the contractor. The intake and forebay were built at the end of the canal, this point being nearly opposite the dam proper. From the intake to the power house, water is conducted to the wheels with two 9-foot diameter steel pen-stocks. The station is equipped with two 2,400-horsepower Morgan-Smith direct-connected, vertical-type wheels operated under a head of 50 feet and connected to Westinghouse generators. The work was started on May 1, 1928, and construction was substantially completed in October, 1928.



THE OLD AND NEW MIDDLESEX DAMS WITH A VIEW OF THE SITE

1. The old wood crib dam which was washed out in the November, 1927, flood on the Winooski River.
2. Looking down Middlesex Gorge showing the dam site about midway of the gorge.
3. The completed new concrete dam and power house



PROGRESS PHOTOGRAPHS OF THE CONSTRUCTION OF THE MIDDLESEX DAM

1. The flume for conveying the river water through the site, nearing completion. 2. Downstream view showing the cofferdam at the tail race. 3. The mixing plant, located on the rim of the gorge, below which is seen the lower end of the flume. 4. General view of the site showing the construction derricks and the flume. 5. Forms completed for the first draft tube. 6. Preparing to unwater the lowest section of the dam site. 7. Cement and gravel storage above the mixer

CONSTRUCTION

Throughout the entire job ledge was encountered, necessitating some 10,000 cubic yards of rock excavation by drilling and blasting. In the dam, pen-stocks and power house approximately 13,000 cubic yards of concrete were placed. The equipment for the work was principally operated by compressed air, furnished throughout the job from a 2-stage, 800-cubic-foot capacity Sullivan compressor outfit driven by a 150-horsepower General Electric motor. For the more remote parts of the operation, Ingersoll-Rand portable compressors were used. Derricks were employed for mucking rock, drilling and channeling, and were all operated by compressed air. The job was equipped with two 90-foot guy derricks at the dam site and one each at the intake and power house. Pumping was done entirely with direct-connected motor-driven pumps. At the tail race LaBour self-priming 4-inch pumps were used, while a single 10-inch DeLaval pump handled the water at the dam.

CONCRETING

The concrete work was divided into two practically equal portions between the dam across the gorge and the power house and intake below. Concrete was

furnished to the dam by an electrically-driven Smith mixer. The aggregates were supplied to the mixer by a skip car and 300 feet of track, an air-driven hoisting engine being used to operate the skip. The skip car was loaded underneath a bin at the foot of a bank having a natural slope of approximately 45 degrees where sand and gravel were dumped. Aggregates were maintained in the stock piles by a single plank wall rigidly braced. In the plank wall gates were placed at intervals to allow ready facilities for opening the skip. Washed sand and screened gravel were imported from outside the state for all concrete work, as concrete aggregates are not available in sufficient quantities in this section of Vermont. A pair of 10-foot capacity Jaeger tilting type mixers supplied the concrete for the intake and power house work.

WATER CONTROL

Owing to the irregular formation of the ledge considerable difficulty was experienced in making the cofferdams tight. Coffers of the timber crib and rock type were used at the power house site, allowing the tail race excavation and power house substructure work to be done entirely in the dry.

Water control for the construction of the dam pre-

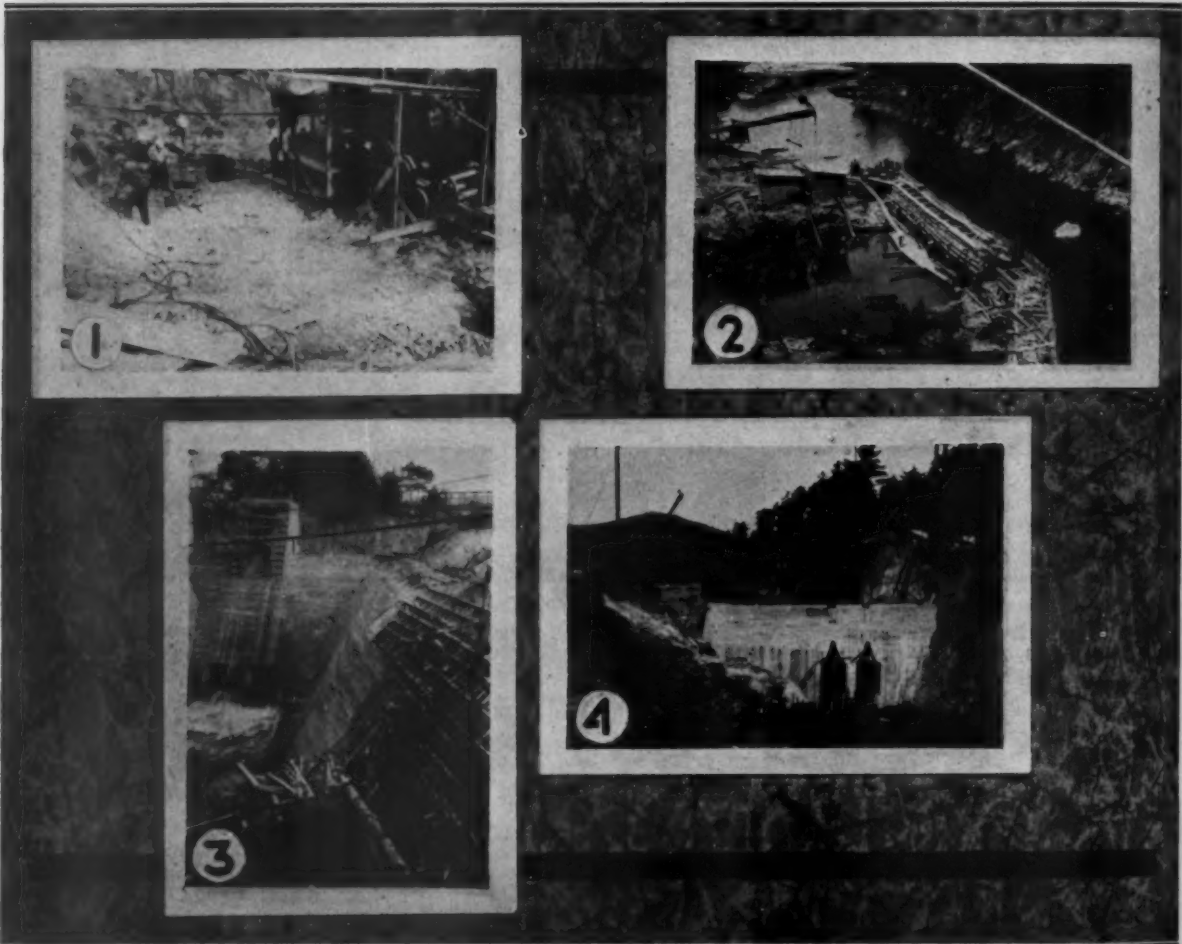
sented a problem even more difficult, as the channel through the rock gorge was deep and too narrow to allow stream diversion. Cofferdams of a type similar to the ones used in the power house were built across the stream above and below the dam site. Connecting the two cofferdams timber and plank flumes carried the stream flow. The flumes were located so that the dam could be built in its entirety by running the timber boxes through sluice gate openings.

Many interesting potholes were uncovered and excavated in the ledge of the stream bed. Some holes

were worn deep into the ledge, many of them being 8 feet or more in diameter and providing excellent anchorage for the structure.

PERSONNEL

A crew of 150 men was employed on the work, with R. A. Langley as superintendent of construction for Fred T. Ley & Co., Inc., and John D. Fitch as resident engineer for Charles T. Main, Inc. We are indebted to Leo D. Woedtke, Fred T. Ley & Co., Inc., for the material on which this article is based and for the illustrations.



VIEWES TAKEN AS CONSTRUCTION APPROACHED COMPLETION

1. Drilling and mucking for the side hill spillway. 2. The tail race completed and the pumps stopped. 3. The concrete dam complete and the flume removed. 4. The sluice gates in place

A New Building Laws Manual

THE first edition of a volume of particular interest and benefit to those engaged in the architectural and building industries of Massachusetts has recently been published by the Massachusetts Building Officials Conference, 80 Boylston Street, Boston, Mass. This book, which will be published annually and is known as the Massachusetts Building Laws Manual, is designed as a reference book and contains accurate information pertaining to the building laws and specifications of Massachusetts.

The contents in detail are the officers and personnel of the Massachusetts Building Officials Conference; the building officials of the Commonwealth of Massachusetts; Form A, covering the laws relating to the erection, alteration, inspection and

use of buildings; Form B1, the regulation relating to the construction of buildings; rules and regulations for garages within and outside the Metropolitan district; steam boiler rules; elevator and escalator regulations; building and zoning laws of the cities and towns; standard specifications for structural steel for buildings and a classified reference directory and buyers' guide.

This manual of 518 pages gathers together for the first time such information covering Massachusetts and should be a very useful volume for daily reference for those engaged in the building industry anywhere in that state.

The 1930 Convention and Road Show of the American Road Builders Association will be held in Atlantic City, N. J., January 11-18, 1930.

New Concrete Highway in Cliff Dweller Country

By Wiley O. Edgington

Acting Project Engineer, New Mexico State Highway Department, Albuquerque, N. M.



EW MEXICO Federal Aid Project 88-B, located on the main highway between Albuquerque and Santa Fe, the largest city and the capital of the state, respectively, represents the completion of another link in what will some day be a hard surfaced trans-continental highway. Two

U. S. Routes, Nos. 66 and 85, converge between the two above cities and both use this new piece of pavement. The job consisted of grading structures and concrete pavement complete. The pavement is 18 feet in width and 6 inches thick, with Maricopa sections at the outside 2 feet. It is crowned 1 11/16 inches and all curves are flattened, super-elevated and the sharper curves widened.

RELOCATION

The new highway is practically a relocation of the old road, being, roughly, 2,400 feet of new line over the old, shortening the distance by approximately 3/4-mile through the use of a more direct route and the elimination of numerous winding curves. The section of the new line overlapping the old which is only about 6 per cent, lies in the town of Bernalillo. The contract for this job was signed with the Lee Moor Contracting Co., El Paso, Tex., March 28, 1927, and construction began March 31 of the same year with a small grading crew, teams and fresnos.

HANDLING TRAFFIC

Little trouble was experienced with traffic because of the new location. Traffic continued to use the old road uninterrupted during the construction of most of the work. Where the new pavement coincided with the old road in Bernalillo, traffic was detoured down either side of the new pavement or down the borrow pits. All traffic was kept to the right, thus avoiding any confusion. The detours were kept in shape by the contractor as well as could be expected by frequent blading and hand labor. Persistent rains, which are very uncommon in New Mexico, caused some trouble, as there was little drainage on the detours.

STRUCTURES

Structures on this project consisted of one double 40-foot span concrete girder bridge, three spillways, 13 concrete box culverts and siphons and 49 concrete pipe culverts and siphons. The structures, with the exception of the concrete pipe, were poured in place with a one-bag Packard mixer with the occasional help of a 2-bag Smith mixer and the 5-bag Multi-Foote paver on one of the big structures. The pouring of these structures began in July, 1927, and ended in May, 1928.

While there were only some 1,100 cubic yards of concrete in these structures, the pouring dragged out over 11 months, as there was no particular organization or system for handling them. Some time was also lost in mid-winter when the temperature reached a point where aggregate and water would have had to have been heated had concreting been continued at that time. Rather than do this, the contractor waited for the temperature to rise. Some structures were poured, however, when the night temperature went below freezing. These structures were housed with tarpaulin and kept heated with salamanders.

The concrete aggregates in the structures were of three classes. Class A was used in box culverts and siphons, bridge and pipe headwalls, Class B in cut-off walls to concrete spillways, and Class C in pre-cast pipe. The mixes or proportions of materials in these concretes were determined by tests, and were varied in the field to get the proper consistency and workability and to give the desired number of sacks of cement per cubic yard placed. This latter, however, was secondary, as the strengths required in compression at 28 days were 2,000, 1,700 and 2,800 in the order named above. The maximum sizes for coarse aggregates used were 1 1/2, 1 1/4 and 3/4-inch respectively. The aggregates were produced on the job by the contractor from an old dry wash a little to the north of the center of the job and 700 feet off the center line.

GRADING

Grading consisted of such excavation along the roadway proper as was necessary for the construction of the roadbed above profile subgrade, and the excavation of such drainage and irrigation ditches as were necessary to care for storm and irrigation waters crossing the job. The combined excavation quantity was 17,000 cubic yards of common earth at a unit price of 25 cents.

Fills were made as far as possible by using excavation from the roadbed. Where this could not be done, which happened in a majority of the cases, fills were made from material borrowed from the road side. The limit of free haul for the job was 500 feet and was seldom exceeded either in theory or practice. The material used in the building of the subgrade was graded from fine blow sand, coarse river sand, to heavy dense clay or adobe. In round figures the total borrow for this job, including protection dykes, was about 51,000 cubic yards at a bid price of 25 cents per cubic yard.

Teams and fresnos were used exclusively for building the road, ditches and protection dykes. The quantities were not enough to warrant the shipment of power equipment to and from the work, and there was practically no place where power equipment could have

been used economically.

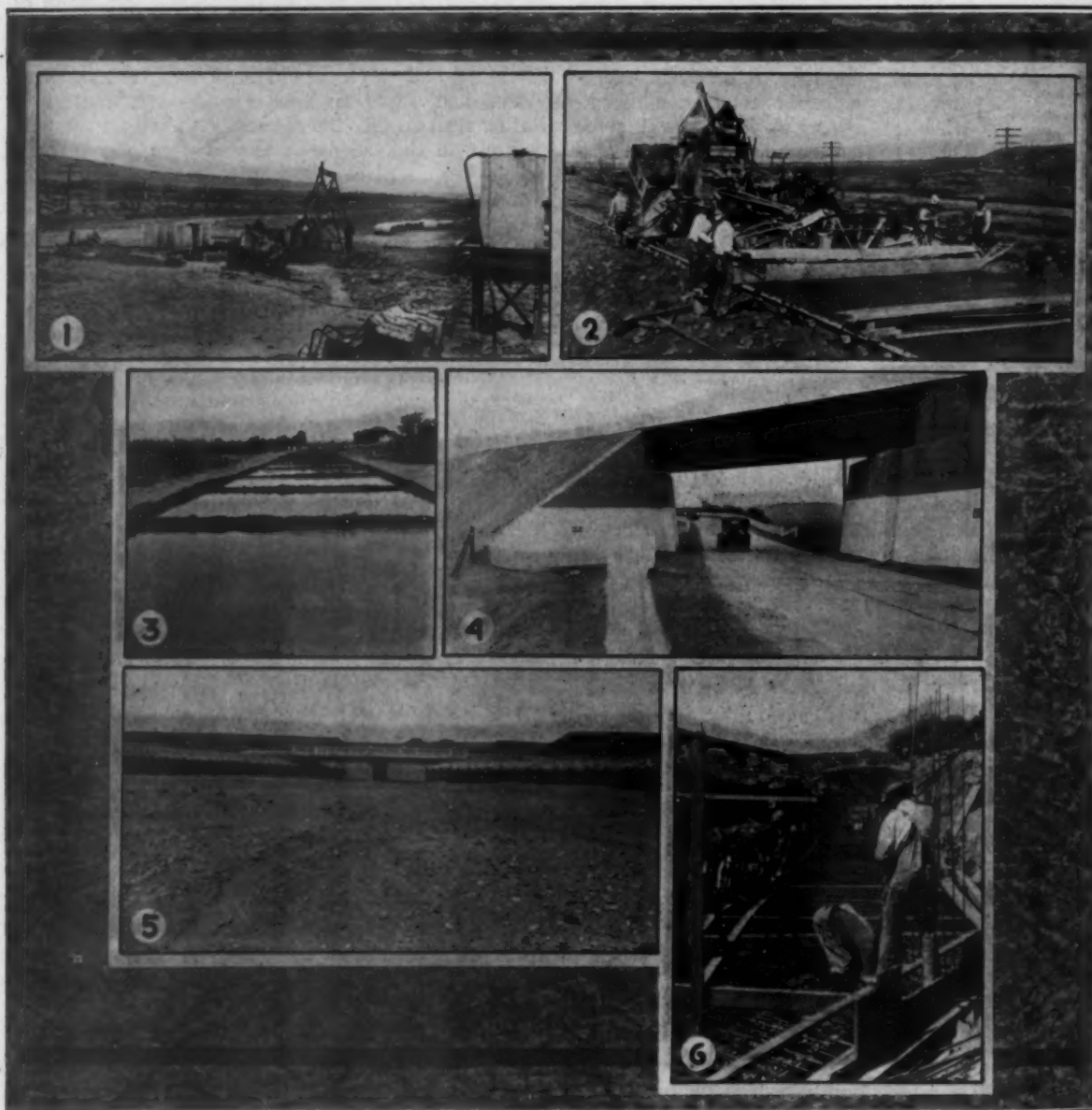
FINE GRADING

The subgrade was first brought roughly to line ahead of the forms by means of a 2H plow and 4H Adams grader. The forms were then set to true line and grade by hand. A home-made subgrader running on the pavement forms and hauled by a 10-ton Austin gas roller was used to cut the subgrade to the required depth. The subgrade was then thoroughly rolled, after which a template cut to the exact cross section of the subgrade was placed on the forms and used as a guide for the fine grading which was done by hand labor. If there

was any appreciable amount of filling required under this template the loose material was rolled ahead of the pavement. The subgrade was then sprinkled, and the trucks hauling aggregate over it tended to compact it further. These trucks did, however, cut the subgrade badly, requiring complete reshaping behind the paver before placing the concrete. A final check was made with a scratch template pulled by the paver.

SUBGRADE TREATMENT

On sections of the subgrade where adobe formed most



VARIOUS STAGES OF OPERATION ON THE NEW MEXICO FEDERAL AID HIGHWAY 88-B

1. Precasting 24 and 30-inch concrete pipe. 2. Pouring pavement on a superelevated unwidened curve. The curves were flattened and the finishing machine could not be used for finishing. The finishing machine was used for the strike-off and the pavement finished by hand. 3. Curing pavement by the ponding method. The pavement was kept completely covered with water for ten days after it had been placed. 4. New railroad underpass constructed on 88-B showing the structure completed. 5. View of double 40-foot span concrete girder bridge looking down stream showing pile bank protection. 6. Placing reinforcing steel in footing of 120 foot 8 inches by 4 foot concrete syphon. This structure was approximately 120 feet between the heads and placed on a 60 degree skew, or at an angle of 30 degrees from the center line of the roadway. The piling was required in the bottom of the excavation as protection against quicksand

of the subgrade material, a 2-inch sand cushion was placed between the pavement and the subgrade. The fine grading for these sections was identical with the other portions of the work, except that the template used was two inches deeper. Particular pains were taken on the sections where the sand cushion was placed, as no corrections could be made at the final check behind the paver. Slight variations in the subgrade could be corrected at the scratch template behind the paver when the sand cushion was not used, but any corrections at this template where the cushion was used, either reduced or thickened the sand cushion. For this reason the subgrade for the treated sections were left slightly low to avoid any thinning of the sand cushion to less than 2 inches at the final check behind the paver.

FORM SETTING

The trench for forms was cut with an Adams 8-foot grader, bringing the grade or base for the forms as nearly as practicable to the desired grade. The final set of these forms to take care of slight variations was done by hand. The same crew was used for this work as was used for the preliminary check of subgrade. The number of men used varied considerably, depending upon the outside trimming to be done and the number of feet of forms to be set for each day's run. Lakewood 6- x 9-inch forms were used.

CONCRETE AGGREGATE

The coarse aggregate for the pavement was $2\frac{1}{2}$ inches maximum dimension, well graded and running down to $\frac{1}{4}$ -inch. The sand was graded from a maximum size of $\frac{3}{8}$ -inch to an allowable limit of 3 per cent dry weight, passing a 200-mesh sieve. The aggregate for the pavement, as well as for all other concrete, was produced on the job by the contractor.

Cement was purchased from the Southwestern Portland Cement Co., El Paso, Tex., and was shipped to the nearest siding on the Santa Fe Railroad, which parallels the new road. The cement was hauled from the railroad siding to the paver in one-ton trucks and placed ahead of the paver. Three laborers were detailed to dump the required number of bags of cement into the paver skip.

The screening, crushing and washing plant was located in the old wash at a point a little to the north of the center of the job. The material from the pit did not furnish the aggregate of the proportion required, resulting in the waste of considerable crushed rock until a sand pit was located nearby and this material added, giving a better balance of aggregate. Previous to the addition of the sand, the contractor had to run two 12-hour shifts to keep the mixer supplied with material during the 10-hour run. The addition of the outside fines, together with some minor improvements in the plant, allowed it to keep up with the paver in the same 10-hour working day. While the cost of aggregates was not reduced 50 per cent, it approached that, as the contractor was able to supply the materials with half the number of men and at one-half the equipment cost.

The aggregates were measured at the plant in Blaw-Knox batchers and hauled by a subcontractor to the paver in 3-ton White trucks in batch units. The aggregates were proportioned by volume in estimated proportions of 1:1.7:3.5 mix. This mix, however, as in the case of structures, was not strictly adhered to, but varied at

the batchers to produce the desired results in the concrete in place.

The job was divided into three sections for the haul of concrete aggregate for the pavement. The subcontractor was paid by the yard-mile based on the pavement placed. The work of the subcontractor was augmented by the general contractor, using some of his own trucks and a few outside trucks during periods of extreme haul.

The gang operating at the screening, crushing and washing plant consisted of one foreman, one mechanic, one oiler and general repairman, one hoist operator, one fireman for the hoist, one feeder and one man to operate the batch boxes and three laborers. In addition to these there was a pump operator.

REINFORCING AND JOINTS

American Steel & Wire Co., wire fabric was used over the sections of the job where it was considered that the subgrade had had insufficient time to settle. The slab through the spillways was also reinforced with this fabric. A 25-foot slab on either side of the bridge was reinforced by $\frac{1}{2}$ -inch square bars to provide against settlement of the backfill behind the abutments. Otherwise the pavement was not reinforced.

Truscon metal center joint was placed in the center of the pavement, or 9 feet from the outside of widened curves. The center joint was held in place by pins until the concrete was deposited by the 5-bag Multi-Foote paver.

The transverse expansion joints were spaced 60 feet, except at construction joints placed at intermediate intervals where the pouring had been held up for 30 minutes or longer. Over one part of the job these transverse joints were staggered from 3 to 4 feet. Otherwise the joints were placed straight across.

CONCRETING GANG

From 4 to 8 men were used to spade the concrete when it was placed on the subgrade. These laborers kept the concrete up to the finishing machine and worked it along the forms.

FINISHING OPERATIONS

A Lakewood finishing machine was used to strike off and tamp the pavement behind the machine. This was also used for rough belting the pavement. The machine could not be used on super-elevated curves, as these were flattened. It was used, however, for strike-off and rough belting. On curves of 10 degrees or over the pavement slab was widened and the crown taken out. On such curves the machine was taken off altogether and all finishing done by hand, using from 2 to 4 men for hand tamping and screeding. Two men were used as finishers behind the tamping and rough finishing. They took out any irregularities left in the pavement with a 16-foot float and gave the pavement its final finish with the belt. Another man was kept busy taking out the caps of the center joint and finishing and tooling the center and transverse joints, as well as tooling along the pavement forms.

CURING

As soon after the pavement had been placed as was possible the concrete was covered by burlap and kept damp by sprinkling. The time required before this burlap could be placed depended upon the atmospheric

conditions. On hot, dry days, especially when the wind was blowing, the burlap was kept up with the finishers. On the other hand, on cool still days, when there was not much evaporation, the pavement did not dry out so fast and the burlap was not placed in some cases for an hour or more after the pavement had been finished.

The burlap was left in place and kept damp until the following morning, when it was removed and the pavement straight edged. Such irregularities as were found in excess of $\frac{1}{4}$ -inch in 10 feet of pavement were taken off by hand and the roughened pavement smoothed. A crew of from 4 to 12 men then threw up dykes along the edges of the pavement with transverse dykes at intervals, depending upon the grade of the pavement; the steeper the grade the closer the dykes. The ponds made by these dykes were then filled with water and kept filled for ten days.

The pavement was not opened to traffic for 30 days after it had been placed. As the new road was almost an entirely new location it was not opened to traffic

until the last pouring was 30 days old.

SHOULDERS

The subgrade of this road is 26 feet wide and the pavement slab 18 feet. This left a 4-foot shoulder on either side of the pavement. Two feet of this, adjacent to the pavement, was taken by a 2-foot gravel shoulder 9 inches deep, which was rolled with the 10-ton gas roller used on the subgrade.

PERSONNEL

The contractor for this work was the Lee Moor Contracting Co., El Paso, Tex., of which Lee Moor is President. Several superintendents were on the job during its progress, with W. E. Orr, of El Paso, acting during the major part of the work. The work was done under the supervision of the New Mexico State Highway Department; W. S. Davidson, State Highway Engineer; Frank Kimball, District Engineer, and J. A. Boulton and Wiley O. Edgington, as Project and Acting Project Engineers.



A Thew Dragline Excavating Sewer Trench

The Use of Draglines on Sewer Work

ON sewer construction where the sizes of the structures are over 36 inches internal diameter and no rock excavation will be encountered, small dragline machines of $\frac{3}{4}$ - to $1\frac{1}{2}$ cubic yards capacities are very flexible units. Dragline buckets now on the market actually dig which is the principal factor and usually determines the progress of the job.

For conditions where it is adapted a dragline on sewer work has the following advantages:

1. The machine goes ahead of the cut and is therefore always standing on firm ground.
2. The excavated material can be easily placed well up and away from the trench, reducing the likelihood of cave-ins.
3. Surplus material can be loaded for removal.
4. The bucket may be detached from the hoist line and a hook or sling attached and the machine used for lowering and laying pipe. The stability of the machine at various radii is

a very important factor in this connection.

5. On monolithic structures forms may be handled with the machine.

6. The trench may be backfilled in a most efficient manner.

7. While not well adapted to extremely hard digging, such as shale or hardpan, it will easily handle stiff clay, mixed clay and boulders.

A long boom is of great advantage on a machine of this type, as it governs the depth dug and the speed or capacity of the machine.

The progress or speed at which the trench can be made, and the sewer laid, depends entirely upon local conditions, the kind of material being excavated, the width of trench and the personal element as regards the operator and supervision of the work. One example may be cited where a machine of the gasoline type equipped with a 1-cubic-yard bucket, dug a trench for a 54-inch pipe 12 to 14 feet deep at the rate of 90 to 140 feet per day. This same machine was used for lowering and placing the pipe in the trench. The material handled averaged 450 cubic yards per 10-hour day. The conditions on the job were ideal as the material was a sandy loam and the sides of the trench were carried on a little less than 0.5 to 1 slope.

The general factors to consider in the selection of the dragline in sewer work are:

1. Class of materials to be dug.
2. The depth and width of trench.
3. Whether or not there is sufficient room for a spoil bank.
4. The size of pipe to be laid together with the radius on which it must be handled.
5. Overhead clearances.

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The Ideals of Engineering Architecture

IN an endeavor to impress upon the present and coming generations of English-speaking engineers the need for more art in engineering, Charles Evan Fowler, consulting civil engineer, has written "The Ideals of Engineering Architecture." Consideration is given to the history of engineering design and the relation between engineering and architecture. Following its opening chapters is one devoted to the fundamentals of esthetic engineering design and then the application to stone arch bridges, concrete arch bridges, steel arch bridges, suspension bridges, cantilevers, continuous bridges and draws, truss bridges and viaducts, abutments, piers and bridge details, stone towers and light houses, steel towers, retaining walls, dams and tunnel portals and power houses. The book is published jointly by E. & F. N. Spon, Ltd., London, England, and Gillette Publishing Co., Chicago, Ill., price \$4.

Construction of Gorgas Steam Plant —A Well-Planned Job

By M. P. Anderson

Assistant Construction Engineer, Dixie Construction Co., Birmingham, Ala.



THE Dixie Construction Co., completed in April a 15 months construction program for the largest turbo-generator unit in the south. This 60,000-kw machine is the initial installation of a 200,000-kw steam plant for the Alabama Power Co. The company has a plant of 70,000-kw capacity in 3 units close by the site of the new one, which is located at Gorgas, Alabama, on the Warrior River, in the heart of coal fields, the nearest town of any size being Jasper.

The new unit is supplied steam at 465 pounds pressure from two 3,032-horsepower cross-drum boilers. Pulverized fuel is to be used and no small part of the job was the housing and installation of equipment for the complete process of reducing and handling run-of-mine coal from track hopper to burners. The draft equipment includes two of the largest fans in the world. The turbine is fitted with a 70,000 square foot, two-pass condenser which requires 85,000 gallons of cooling water per minute.

PLAN OF DEVELOPMENT

The plan of development included the building of boiler foundations and part of the condenser pit walls for the second unit, and provided cooling water facilities for the ultimate plant. The Warrior River is navigable past the site by reason of a dam below and consequently during low water periods the river is more of a pond than a flowing stream. To prevent re-circulation of condensing water under these conditions the



This View Shows How the Dragline, Working on the Left, Loaded Cars Which Were Hauled and Dumped Into Substation Fill at Right. Concrete Plant May Be Seen at Edge of Fill with Aggregate Handling Derrick to the Rear

intake for cooling water is located about one-half mile upstream from the plant and a canal dug paralleling the river for this distance. The concrete discharge tunnel from the new plant spills its water into a creek between the old and new plants and from which the old plant takes its cooling water. For this reason the canal was extended past the new plant and the cool water carried in a submerged timber flume across the creek to the intake at the old plant. High water records demanded that the powerhouse walls be stable against water pressure for a height of 38 feet above the condenser pit floor. For the same reason and due to lack of high ground close by it was necessary to make a fill adjoining the plant upon which to place the outdoor substation.



Distant View Showing Switch House Which Is Located on Center Line of Ultimate Plant. Temporary End of the Power House Is Covered with Corrugated Iron



The Concreting Plant Showing the Tunnel Forms in the Fore-ground. Note the Depth of Fill and Thickness of Original Ground Between Fill and Rock

These special conditions plus the usual provisions entailed the following quantities: earth excavation, 283,000 cubic yards; rock excavation, 24,000 cubic yards; concrete, 27,000 cubic yards; reinforcing steel, 1,550 tons; structural steel, 2,500 tons; brick, 1,480 M.

CONSTRUCTION CAMP

There was the usual operators' village at the old plant, but no accommodations for housing and feeding the 800 men employed at the peak of operations, and first consideration was given to the construction of living quarters. Fifty houses for the use of the power company operators were built at this time and occupied temporarily by the construction forces. Bunkhouses supplemented the above. For the convenience of responsible family men in the trades group, an area was designated as a build-it-yourself camp where material was furnished at cost and the account collected through payroll deductions. All common labor was negro, and a separate camp for this group was necessary.

A new 22-bed hospital served the construction forces, the operators of the old plant and employees of the coal companies in the district. Other service buildings included a commissary, mess hall, first-aid station, etc.

A new water filtration plant was constructed to care for the additional demand.

The permanent and bunk house group were served by a septic tank system of sewage disposal, while pit-type toilets were used elsewhere.

RAILWAY CONNECTION BUILT

The initial move towards all operations was the construction of a standard gage connection between the existing line at the old plant and the new site. This connection was not long and was put in without delay.

EXCAVATING EQUIPMENT AND PERFORMANCE

The canal, involving 185,000 cubic yards of earth, presented the major excavating problem from quantity considerations. Plans called for a dyke between the canal and river and thus a side casting operation was evident. Rock in the powerhouse area was burdened by some 25 feet of clay, all of which had to be removed to make room for the condenser pit. The substation fill adjacent required about this amount of ma-

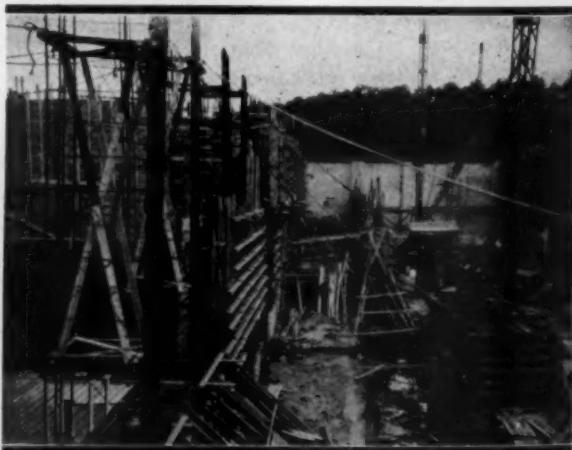
terial and more side casting work was foreseen. A 2-yard steam crawler-mounted Bucyrus dragline machine with 70-foot boom, was selected for this work. Two passes were made on the canal work, while the powerhouse and intake area required three passes. On the first pass the material was placed directly in the fill but on the second and third trips lack of reach necessitated the material being loaded into dump cars and hauled to the fill by dinkies. On side casting work this machine averaged 900 yards per 10 hour shift, not counting serious delays.

Most of the rock taken out made way for the cooling water tunnels which were outside the building line and below the condenser floor. The shale and sandstone were easily drilled with hand-held and tripod mounted tools and good breakage was secured without trouble. Quite a bit of the material in this trench was loaded to cars by the dragline. Rock excavation in general was loaded by hand and by a one-yard steam shovel into skips which were handled to dump cars by derricks.

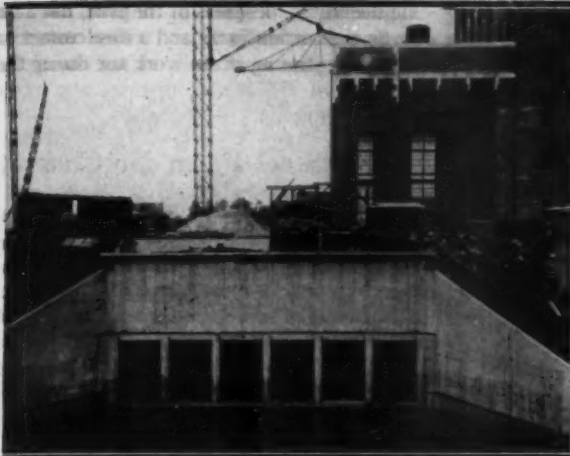
CONCRETE PLANT

An Insley boom plant for chuting the concrete was selected as the equipment most suitable for the purpose. It was located just clear of the water tunnels at the toe of the substation fill and near the center of mass of the concrete. The substation fill afforded uncongested space for the mixing plant. Here it was possible to build the plant after the fill was made but before concrete was needed. It was hoped for and realized that the plant would have served its purpose before the construction of the substation was much under way.

By reason of the height of the fill above the base of the chuting tower a gravity mixing plant was possible. The charging floor of the overhead bin plant was placed a few feet below the top of the fill to be on a level with the floor of the cement house. A spur track on the fill back of this building had sufficient elevation to chute sacks of cement to the storehouse or to the charging floor of the mixing plant as desired. Back of this track was another line which crossed two pits into which slag and sand were dumped from standard gage



View of the Condenser Pit Showing the Surrounding Walls. The Boiler Column Reinforcement Shown at the Left Was Put Together in a Horizontal Position in the Yard and Placed as a Unit



The Intake Chamber of Sufficient Size to Serve Four Units

hopper cars. These materials were rehandled to stock piles or to the mixer bins by a one-yard clamshell, 10-ton guy derrick rig having a 100-foot boom. A one-yard non-tilting Smith mixer was used and the Blaw-Knox material batchers and hoist bucket were of corresponding size.

GENERAL EQUIPMENT

When the heavy excavation was completed in the powerhouse area, three 10-ton, 100-foot boom guy derricks were put in. These outfits did general service work such as handling skips of excavated material, reinforcing steel, forms and form lumber and assisted in making changes in the chuting plant.

Two locomotive cranes, a 20-ton, 50-foot boom Orton-Steinbrenner and a 40-ton, 50-foot boom Industrial, were useful in unloading and loading equipment and general handling duty.

Railroad equipment consisted of three dinkies, four flat cars and six 12-yard dump cars. Tracks were conveniently located and practically surrounded the powerhouse on all sides.

Air was furnished by a 1,200 cubic-foot Worthington compressor electrically driven.

Electric power was furnished from a bank of three 250 kw, 44,000/2,400 volt transformers.

FLOATING EQUIPMENT AND PERFORMANCE

A derrick boat and a barge were used for the work in connection with building the canal intake structure and the submerged timber flume to the old plant.

Subaqueous excavation was necessary to clean the rock upon which the rock-filled crib intake structure was built. The derrick barge was fitted with a one-yard clamshell for removing the mud and silt and during crib building handled the timbers and rock fill from barge to place. Templates were made of the river bottom and the cribs shaped to fit.

Excavation and backfilling under water and pile driving were done with this equipment in building the timber flume. Mud was removed from the bottom by clamshell to make room for the 8-foot by 10-foot flume of 3-inch lumber. Anchor piles were then driven in two rows outside the area to be occupied by the box. The flume was built in 30-foot sections, launched floated to position, tied together and sunk. It was held

in place by cross members bolted to opposite piles. Backfill was then placed against the sides.

REINFORCING STEEL YARD

Reinforcement was purchased in carload lots of mill lengths and all bending and cutting done on the job. An area between two track fills near the structure was utilized as a yard where the steel was unloaded by hand and slid on ways to piles below. Locomotive cranes handled the steel in packages after a lot had been cut and shaped. A Pels power shear and Wallace bender were employed as the maximum size of steel was 1½ inch square section.

CARPENTER SHOP

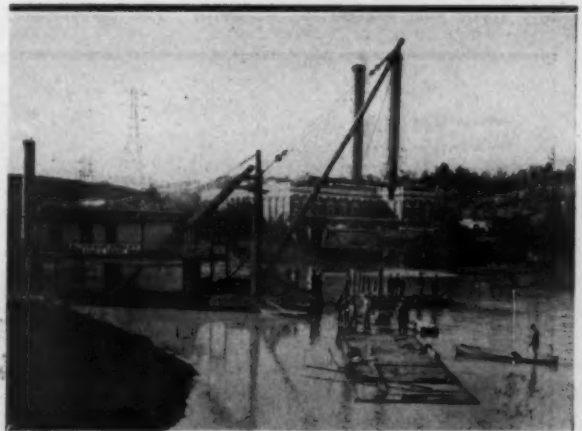
Four million, eight hundred thousand feet of lumber were used on the job. Practically all of this material was secured from mills in the vicinity. Delivery was by truck and rail to the lumber yard or to the carpenter shop as desired. All lumber was bought rough and planed as needed at the shop. Built-up forms for the tunnels, forms for the condenser pump intakes and discharges, cutting dimension pieces and the planing operations kept the shop busy. A shop order system was used.

MACHINE SHOP

A machine shop employing the usual lathe, planer, drill press, air hammer, power saw, etc., was put in. Especial attention was given to machines for cutting and threading pipe and the shop was equipped for doing this work on sizes up to six inches. The operations of this shop also were under a shop order system.

STEEL ERECTION

A 10-ton, 100-foot boom guy derrick was located in one of the boiler bays for placing steel. From this position it could reach flat cars upon which the material was brought in. When the derrick worked out of one elevation it was hoisted vertically, supported on the steel framework and the erection continued. The locomotive cranes assisted in steel erection when needed. Towards the end of this construction phase the 72-inch diameter boiler drums weighing 93,000 pounds each were installed. They were skidded from flat cars through the frame work to a position under their location and then hoisted vertically to place.



View of Old Plant Showing Submerged Timber Flume for Carrying Cooling Water in Course of Construction



A View of the Temporary End of the Plant Showing the Steel Erection Derrick on Top on the Structure. The Dragline Machine at the Right Is Backfilling Around the Switchhouse and Against the Power House. Note the Trestle Into the Turbine Room and the Reinforcing Steel Yard in the Foreground at the Original Ground Level

BRICKWORK

Patent scaffolding was employed on the outside walls of the powerhouse but an inside wall and the walls of the switchhouse were built from wooden falsework. Brick in original box cars was unloaded at the base of the elevator.

SUBSTATION

Precast concrete piles were driven by a McKiernan-Terry hammer through the fill to penetrate original ground and foundation slabs poured connecting them. Bases for transformers, oil switches and bus structures were made in this way. The piles were cast on the job and driven by a steam hammer. The stocking derrick at the mixing plant came in handy for handling the piles while the locomotive crane held the hammer and furnished steam.

ORGANIZATION

In keeping with the policy of the construction company, plans for the construction plant and camp, the choice of equipment and a schedule correlating the various parts of the work were all settled upon before any force was placed in the field. The Southeastern



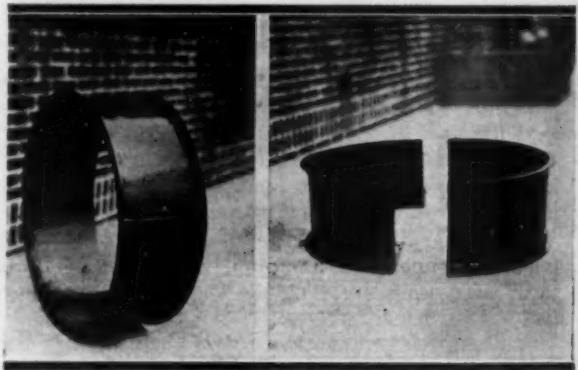
View of the Turbine Room Side of the Gorgas Steam Plant

Engineering Co., designers of the plant, had a bare start on the construction forces and a close contact was vital during the planning of the work and during the actual construction. Offices of the two companies are in the same building in Birmingham, Alabama.

A Welded Sheet Steel Form for Concrete Pedestals

AN interesting use for welded sheet steel as forms for concrete pedestals has been developed by a Long Island contract welding shop for a concern which builds gasoline filling stations. In constructing the concrete pedestal bases, the usual practice has been to use wooden forms built by a carpenter. The disadvantage of this, however, is that the wood often sticks to the concrete, leaves marks or loosens the concrete in removal and usually can not be used again. The sheet steel form can be removed by loosening four bolts and can be used over and over again.

These forms are fabricated by the oxy-acetylene process. They are made in two sections which when bolted together form a ring 30 inches in diameter. Each section is made by tack-welding 14-gage sheet steel top and bottom to two pieces of 1 x 1 x 1 1/4-inch angle iron which have been bent so as to form semi-circles. Holes for 3/8-inch bolts are cut with the blowpipe in the ends of the angle iron pieces which project and form lugs for bolting the two sections together.



Sections of the Welded Sheet Steel Concrete Forms

Increase in Welded Buildings During Past Year

THE number of buildings erected by the use of electric arc welding has increased 50 per cent during the past year, according to a recent report. The list of structures upon which this method was employed includes bridges, buildings, cars, cranes, frames and towers, ships, tanks, and others.

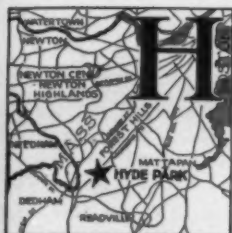
The most notable advance has been in the increased height and size of the buildings where arc welding has been used. A second interesting development is the comparative ease by which existing steel bridges are strengthened by welding new steel to corroded or over-stressed members. Still another phase of welding progress is the changed attitude toward welding shown by many officials of municipal building departments who are permitting welding and at the same time are modifying their building codes to authorize the welding of steel building frames.

A uniform building code has been published by the Pacific Coast Building Officials Conference, Section 2710 of which covers welding, and has been adopted by over 40 towns and cities. The Pennsylvania Legislature has passed a law permitting building departments of cities of the first class to adopt rules and regulations to cover welding, and the American Welding Society has also formulated a code applicable to welding of steel building frames.

A New 67-Foot Concrete Skew Bridge Over a Railroad and Alongside a Swamp

By W. F. Donovan

Senior Assistant Engineer, Division of Highways, Massachusetts Department of Public Works



IGHWAY traffic between Boston and Providence has been materially aided by the recent completion of a short stretch of concrete road and a 67-foot skew span reinforced concrete bridge near the Dedham town line by the Massachusetts Department of Public Works.

This bridge crosses the main line tracks of the New York, New Haven & Hartford Railroad and its foundations are on the edge of a rather deep swamp.

The new road was widened from 20 feet to 80 feet to meet a 100-foot boulevard in Boston and, as the old bridge adjoined a swamp, special studies were made to determine the extent of foundations required. Test borings were made at the site and it was found that extensive peat excavation was necessary but that underlying the swampy area there was a good solid bottom. On the southerly side the hard bottom was found identical with interpolations from the borings made at a depth of 16 feet below the railroad track and 35 feet below the highway. On the northerly side in the westerly wing after excavating to the indicated grade punchings were made and it was found that it would be necessary to excavate from 5 to 8 feet deeper to hard bottom. As the contractor had figured on getting to the plan grade without the use of sheeting, and, in fact, had excavated a part of the area without sheeting, he claimed extra compensation for the overdepth and was awarded the actual cost of the sheeting and pumping.

The plan grade showed an excavation of from 10 to 15 feet below the track, but it was found necessary to go from 15 to 23 feet below. The error in the grade was attributed to the interpretation of the boring samples which were designated as fine black sand, but it was really a mixture of peat and sand which penetrated in from the slopes of the old road. A gravelly hardpan was the bottom finally encountered and upon that a rubble concrete base of 1:4:8 concrete was placed with the large stones from the old wing walls used for the rubble.

A pump well was sunk in the low end of the swampy area and a network of hard pine wooden boxes placed for an underdrain. This kept the section dry during the placing of the rubble concrete.

The plans called for the retention of the old north abutment wall of dry rubble masonry for a length of about 40 feet. This wall offered additional hazards as it was necessary to excavate below the bottom of the

abutment at the junction of the old and new walls. It was evident that the original foundation for the north abutment had not been excavated to hard bottom, but large stones weighing from 4 to 6 tons were imbedded in the peat and had settled through it to a firm bearing. Therefore, 3-inch sheeting was driven along the toe of the old wall 15 feet beyond the point of juncture to prevent sliding. The courses of the stone abutment were broken back to allow the concrete to lap over and eliminate a vertical joint at the bond.

GROUTING OLD ABUTMENT

Before the deck of the bridge was built it was decided to grout the old abutment and a 1:3 mix was used. A grouting machine was set up on top to mix the grout which was spouted down to hoppers placed over holes opened up in the horizontal joints. It was interesting to note the progress of the grouting as it seeped out at each successive horizontal joint. In all 250 barrels of cement were used in this process and fully 100 barrels had been used before there were any indications of where it was going.

From offsets taken on the old abutment, it was found that a 1 to 1½-inch outward movement had occurred between the time the old deck of the bridge was removed and the centering of the new deck was removed.

CONCRETING THE DECK

In constructing the deck it was decided to split it up into three sections. The center section of the road of beams and slabs was poured first and the girders with adjoining sidewalk slabs were poured separately.

The day the first girder was poured, the weather was threatening in the early morning, but the contractor, pressed by the lateness of the season, started work, but within an hour a heavy rain started in and it was necessary to pour this girder without horizontal joints. The whole outfit worked in oilskins to keep things going. This group of yellow-coated and yellow-hatted men working with feverish haste in the heavy down-pour to finish the concrete presented an interesting picture.

A Foote paver and a ½-cubic-yard gasoline-powered mixer were used to mix the concrete which was hauled up runways in buggies and deposited in the deep girder forms. About 8 hours work was necessary to pour the 120 cubic yards.

ERECTION OF CENTERING

The centering for the deck was erected as follows:

two center rows 16 feet apart to allow railroad car clearance built up of 10 x 10-inch hard pine posts, set on 10 x 12-inch hard pine sills 3 feet on centers under the girders and 6 feet on centers otherwise. A 10 x 12-inch cap was placed which carried 8 x 12-inch girders and a 3 x 4-inch flooring which carried the beam forms which were 17 inches wide and 29 inches deep and spaced 5 feet on centers. Adjoining the abutment walls 6 x 6-inch posts and sills were used instead of 10 x 10-inch posts. All posts were set up on oak wedges placed on the sills, so that the whole structure could be raised or lowered by driving or loosening the wedges.

The New York, New Haven & Hartford Railroad Co., in order to facilitate the work gauntleted the

tracks and cooperated in every way to push the work to completion.

REMOVING THE CENTERING

Just 21 days after the concrete was placed the removal of the centering began. An engineer's transit was set up and carefully levelled and a line corresponding to the center cross hair was drawn along the girder so that with a sweep of the telescope close watch could be kept on any settlement. Below the structure a selected crew with hammers loosened the wedges under the posts, starting under the center of the bridge and working out toward the girder. Several trips were made, tapping the wedges lightly each time until they were finally removed, the centering in this



FOUNDATION EXCAVATION AND CONSTRUCTION AT THE NEW REINFORCED CONCRETE HIGHWAY BRIDGE, AT DEDHAM, MASS.

1. Sheeting for the foundation at the left and new wall completed at the right. 2. The old abutment wall and part of the new wall at the right. At the left is the excavation at the old abutment. 3. A view of the centering. 4. The centering after lowering. 5. The skew bridge after the removal of the centering

way being gently lowered away from the concrete. Men were stationed on top on both sides of the girder to watch for cracks, but none appeared and the maximum deflection in the center, as determined from the transit level, was only $\frac{1}{4}$ -inch.

The same operations were repeated on both sides and with the same results. Daily levels were taken on top of the girders for two weeks after the removal of the centering to watch for settlement, but none appeared and, then, four months after the construction was completed, the girders were again checked, but no settlement had taken place.

Although the plan showed that the bottom of the girder should be level a camber of $2\frac{1}{2}$ inches was actually allowed, 1 inch being for an anticipated settlement in the pouring of the concrete and $1\frac{1}{2}$ -inch was allowed for deflection after removing the centering. During the pouring of the girders a settlement of $\frac{3}{4}$ -inch in the center and $\frac{1}{2}$ -inch at the quarter points were found, but this had been anticipated and a much larger deflection expected, but everyone was happily disappointed on its non-appearance.

JOINTS

The deck and girders are separated from the remainder of the structure by $\frac{1}{2}$ -inch vertical joints between the ends of the girders and the wing walls and $2\frac{1}{4}$ -inch zinc plates between the top of the abutment walls and the beams. The girders are set up on steel castings with phosphor bronze plates.

MATERIALS AND MIXES

All concrete in the structure was made with Dexter cement and the fine and coarse aggregates were furnished by Columbo & Sons of Dedham, Mass. There were 131 tons of reinforced steel, 1,800 cubic yards of 1:2:4 reinforced concrete and 1,800 cubic yards of 1:4:8 rubble concrete.

UTILITIES OPERATIONS

The street railway company operating over this road had a single track system with turnouts but in the new road a double track was laid and a temporary trestle outside the site of the bridge maintained normal service during the construction of the bridge.

The telephone company, whose ducts are underground, built a 15-duct line across the bridge which was incorporated in the deck beam and the water and gas pipes were placed in concrete boxes on top of the sidewalk alongside the girders on the opposite side of the street.

TEMPORARY APPROACHES

Temporary approaches 300 feet long on each side of the bridge were constructed of 3 inches of stone with Tarvia treatment of two applications of $\frac{1}{4}$ -gallon per square yard of surface each. Although a fill of 10 to 30 feet had been placed, it was found in the spring of 1929 that the maximum settlement was only $1\frac{1}{2}$ -inches. This temporary surface stood up very well under the extreme weather conditions of the winter and the heavy traffic which uses this road.

In April the temporary surface was removed as provided in the contract and an 8-inch concrete road slab substituted. In order to open up the road as soon as possible an extra bag of cement was added to the standard 1:2:3½ mix and 6 x 6-inch test beams broken

in 8 days showed flexural strength of better than 500 pounds so that the road was opened in 8 days instead of awaiting the usual 14 days.

PERSONNEL

This contract was handled by Simpson Brothers, Inc., 77 Summer St., Boston, with Bernard Melanson as Superintendent and William Powers, Engineer. For the State of Massachusetts George E. Hackness was Bridge Engineer of the Department, Philip Welsh designer and the writer Resident Engineer.

Steel Joists in Building Construction

THE first steel joists were manufactured from sheet steel as early as 1855 and numerous buildings were constructed with such joists from that time until 1908, when the quantity production of pressed steel joists was started. Up to 1923, all joists were of the solid web type, but in that year the production of open web joists was started and the expansion of the industry in the following years was rapid. About 40,000,000 square feet of steel joist floors and roofs are now being constructed annually in the United States and the possible field of usefulness is only partly developed.

As with every new product, the introduction of steel joists met with certain resistance due to the unfamiliarity of engineers and building officials with the proper methods of design and erection, and because of a misunderstanding regarding the fire resistant properties of the construction. In the early days of steel construction, proper methods of fireproofing were not understood and there were numerous failures of steel members in fires. This led to a reaction on the part of the building officials who began to require sufficient fireproofing to resist a four hour fire test. Such a requirement is fair enough for a heavy mercantile building, well filled with combustible material, but is excessive for lighter occupancies. The Bureau of Standards have found that it takes 10 pounds of wood, paper or similar combustible material to sustain a fire equal to its destructive action to a standard one hour fire test, 20 pounds for a two hour test and 40 pounds for a four and a half hour test. In an apartment house having incombustible walls, partitions and floor construction, if we weigh all the combustible material, including wood floor tops, window frames, trim and so forth, the total would be less than 10 pounds per square foot of floor space. The same is true in most office and public buildings. If, therefore, the construction of such buildings is capable of withstanding a two hour fire, it is amply safe for all purposes. Steel joists, protected with a good ceiling of metal lath and plaster, will withstand such a fire as has been shown by actual tests. In fact, the fire resistance of steel joisted floors is equal to many types of concrete floor and the damageability in an ordinary fire is much less than many types of concrete floors.

As these facts are becoming better understood, the use of steel joists is increasing because of the numerous advantages which they offer to the builder; the lightness of steel joist floors result in great economy in steel framing; the open web joists are very convenient for installing piping; the saving in form work is a very great item, especially in buildings where the forms can not be reused. The use of steel joists is particularly attractive to builders in small cities where it is difficult to secure skilled form carpenters and reinforcing steel placers.

There has been a great variety of opinion as to the proper methods of designing and erecting steel joist floors, and in order to standardize these methods, an association of steel joists manufacturers, known as the Steel Joists Institute, was formed in the spring of 1928. As a result of a thorough study of the problems of steel joist construction, a standard specification has been prepared covering the vital points of design, erection and use of steel joists. Copies of this specification may be obtained by writing to the Steel Joist Institute, 1736 Dime Bank Bldg., Detroit, Mich.

"3 1-2 Tons of Girders Plunge 22 Stories; Kill Four Workers"

Such Headlines in Metropolitan Newspapers Are Becoming Too Common Through Carelessness in Derrick Operation on Steel Construction



ARE our steel erectors and building contractors becoming careless in the rigging of their derricks and the slinging of loads to be raised? The answer would seem to be a decisive affirmative when consideration is given to the large number of failures which have been reported in the last

few months, particularly in the New York Metropolitan area, but also quite generally throughout the United States.

One of the worst accidents which has occurred recently happened on April 20, when a 3½-ton sling of eight steel girders dropped from the twenty-second floor of the new Western Union Building at West Broadway and Thomas Street, New York, falling through scaffolding at the eighth and second floor levels and instantly killing four workmen. A dozen other laborers were injured, but all except one were able to go to their homes immediately after first aid.

The general contractors and the steel erection contractors are organizations of highest standing and it is most regrettable that the competitive speed which has entered into building erection should have led to carelessness which must have been the cause of the failure of the brakes on the hoisting engine.

The steel frame of the building which, when finished, will rise 24 stories, was almost completed. The brick layers were working at the ninth story. The girders which fell were intended to support the roof of the tower at the top of the structure. The hoist used for raising the 3½ tons of girders was rated at 15 tons, so that it cannot be said that the hoist was overloaded. Eye-witnesses of the accident reported that the engineer had raised the load to the twenty-first story when he was signalled to swing the boom in. The beams brushed the steel framework of the building and slipped. The slack cable paid out and the automatic brake failed to stop. The engineer immediately jammed on the emergency foot brake, but it, too, failed.

The falling girders tore loose a piece of masonry 15 feet deep and 20 feet across, then sliced through the brick-layers hanging scaffolding, encircling the building at the eighth floor and with its own weight crashed through the protective wooden bridge over the sidewalk only a few feet from the field office of the construction company. Two of the men killed were on the scaffolding which was carried away by the girders and the two others directly beneath them on the sidewalk canopy. Most of those injured were swept from the platform by the wreckage or else hit by bits of building material which flew like shrapnel.

Examine your hoisting equipment daily. Be sure the brakes are secure. Assure yourself that the cable is in perfect condition. See that the sheaves are in proper shape and that the derrick footings and boom are safe.

A.B.C.—Always Be Careful.

Safety All-Ways

BECAUSE an accident has not yet occurred in the face of an existing hazard is absolutely no reason why that hazard should be permitted to exist. Every day accidents are happening which never happened before and they go to swell the sum total of the accident figures. Wherever dangers exist, there is the need for accident prevention.



ANOTHER REGRETTABLE ACCIDENT IN THE NEW YORK METROPOLITAN DISTRICT WHICH COST THE LIVES OF SEVEN WORKMEN

In spite of the evidence of safety devices in this picture, notably the use of a standard sidewalk arcade, and a screen to prevent the ordinary falling materials from reaching the street, carelessness in loading 3½ tons of girders added another fatal accident to the toll in New York City

Good Management in Grading

By A. Stellhorn

Wooster, Ohio



HERE are three requirements for efficient and economical road building on the part of the contractor and over which he has full control: equipment, personnel and management as regards both grading and paving operations.

Grading operations can be classified under, 1, excavating; 2, hauling excavated material to the fill; 3, leveling the material placed in the fill and rolling it; 4, finishing the grade, not including subgrading for pavement, slopes and ditches.

EXCAVATING EQUIPMENT

The units of excavating equipment used must be in keeping with the kind of work to be done. This applies not only to the total amount of work to be done, but also the kind of grading whether earth, sand, gravel, boulders or solid rock. In a general way, the harder the digging the larger the unit to be employed. Rock does not need to be broken to such small dimensions and can be handled easier, while shale, cemented gravels and similar materials can often be excavated by larger units without blasting, whereas this would be impossible with smaller equipment.

If the quantity of work is great, large equipment is always more economical to operate than smaller equipment of less capacity, no matter what kind of material is to be moved.

Excavating equipment must always be in keeping with the hauling equipment. Under the highway specifications of many states there is no such thing as cast dirt. It must be spread in layers, usually about one foot in depth and rolled. Furthermore, it is becoming increasingly difficult to move excavating equipment that weighs between 25 and 40 tons over improved roads. As long as the road was unimproved and the bridges were braced or detoured around, no one in authority seemed to care how heavy a power shovel was, but, today, highway authorities are beginning to ask embarrassing questions about the weights of this kind of equipment.

It would appear that the grading contractor would be best served by as large a power shovel as he can provide work for, if it can be moved over the roads in the section in which he wishes to operate.

EXCAVATING AND HAULING EQUIPMENT

Narrow gage and standard railway equipment can be eliminated as unsuitable for transportation and ex-

cavation on highway construction in most localities. In the first place the yardage is seldom large enough to warrant the outlay for installation and if fills must be rolled, the whole system is barred regardless of the amount of work to be done. The haulage methods narrow down to teams, trucks, tractor-drawn wagons, both wheel and tractor-types, or tractor wagons of various types.

Whatever type is used, it should be sturdy enough to stand up under the use and abuse incident to earth handling. It should be of such capacity that one, two or more passes of the shovel will fill it to capacity. It should have a fair amount of speed, be hard to mire and, furthermore, not cost too much.

Teams have been largely superseded by trucks and now trucks are giving way to tractor-drawn wagons and tractor-wagons of various designs. The grading equipment should consist of excavating equipment of ample size and power and adapted to the work in hand.

It should be rugged and practically fool-proof. The hauling equipment should have at least as great a capacity as the excavating unit.

In organizing a grading outfit, remember that with a good operator a shovel will deliver between 80 and 90 per cent of its capacity

day in and day out, provided it is possible to keep trucks or wagons under the shovel. Take the dirt away and almost any shovel will make the contractor money. On the other hand, if the dirt is not taken away as fast as it can be excavated, no piece of excavating equipment can operate to any degree of efficiency.

Levelling and rolling fill are such that usually the capacity of the rolling and levelling equipment is much greater than the excavating and hauling equipment, and it is hardly conceivable that serious delays could be caused at this place. Crawler tractors with graders or bulldozers and gasoline-driven three-wheel rollers are standard equipment on this work.

FINISHING GRADE BERMS AND DITCHES

Large losses and serious delays are often caused by sloppy work in the rough grading. Under normal conditions, it should not be necessary to bring back power shovels to do this work. A tractor and grader should be able to move all the earth necessary. This does not apply to many of the repaving jobs where large amounts of earth must be borrowed to build new berms.

ACKNOWLEDGMENT.—Prepared from a paper read before the American Road Builders Association.

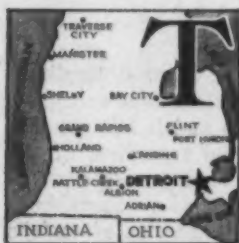
This is the season of road building. The next issues of CONTRACTORS AND ENGINEERS MONTHLY will contain a large number of articles describing unusual and interesting road jobs in various parts of the country.

Good Sense

Never move a yard of dirt a second time if it can possibly be avoided. Do not move dirt for which you are not paid and do not leave too much to clean up. Do not lose sight of the fact that a power excavator will move dirt much cheaper than man power.

Blasting in Foundation Demolition

By W. J. McHenry



To tear down the old, to build the new is the practice in many of our large cities today. Office buildings, apartment houses and department stores, which were amply large enough twenty-five years ago, are now being replaced by modern skyscrapers. In Detroit, Mich., for example, the growth of the automobile industry has caused a rapid development of the city and larger buildings have become a necessity. The J. L. Hudson Co., found that its old department store quarters were no longer spacious enough and decided to add several units to the building.

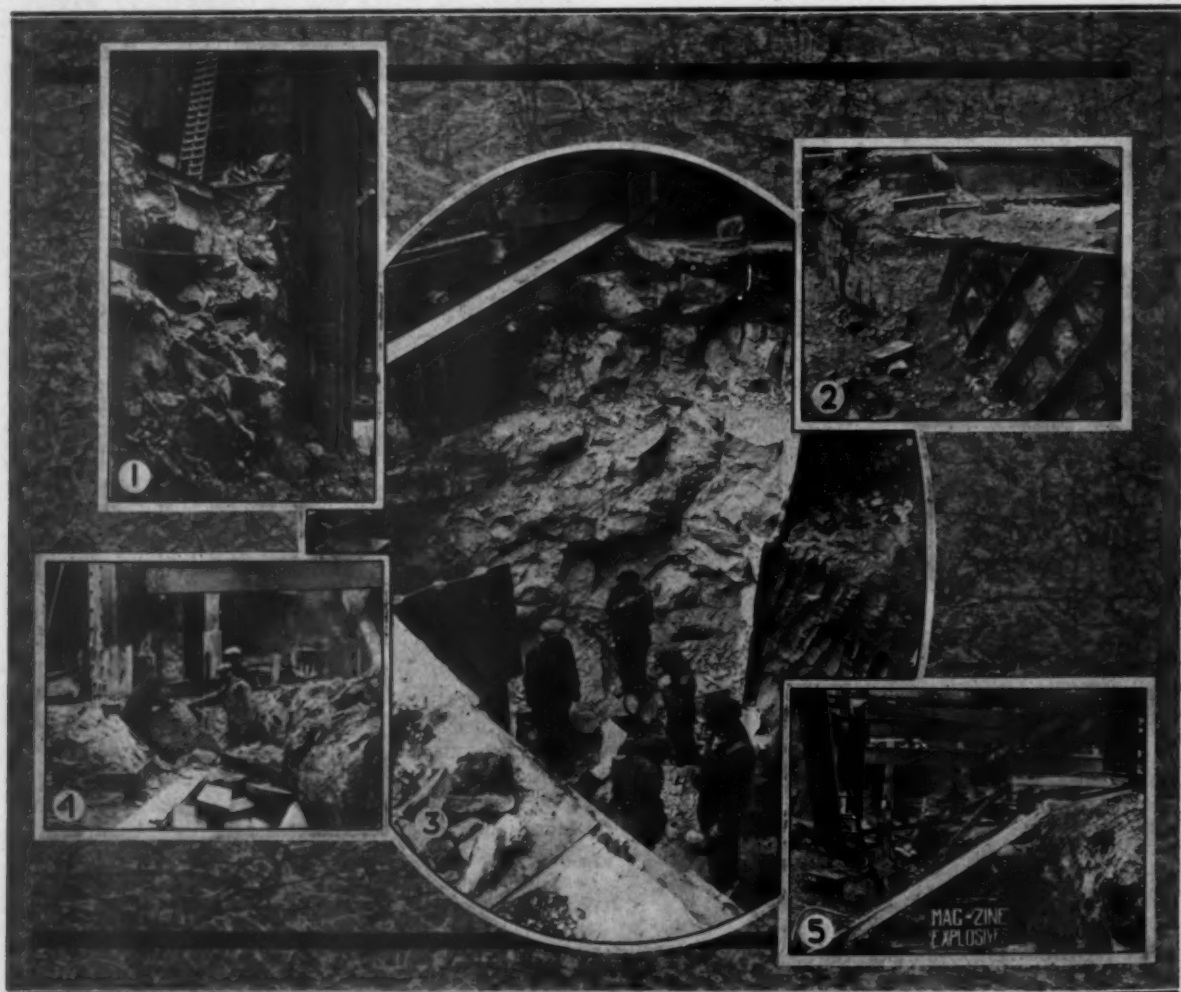
In Detroit little blasting is done for foundation work because bed rock lies 132 feet below the ground

level. When old buildings in the business section are torn down, however, concrete is encountered and it has to be broken up with explosives to expedite the work.

Bryant & Detwiler, general contractors of Detroit, to whom the contract for the new building was awarded, let the foundation work to Spencer, White & Prentiss of Detroit and this company sublet the demolition to the Michigan Foundation Co., Inc., of Sibley, Mich. This concern specializes in breaking concrete, frozen ground and in agricultural blasting and has handled many large jobs of this kind. The work was carried on under the personal supervision of Walter Ross, general manager for Spencer, White & Prentiss and E. E. Renaud, President of the Michigan Foundation Co.

EXPLOSIVES USED CAUTIOUSLY

Construction operations extended over a long period



THE RESULT OF WELL MANAGED BLASTING IN A CONGESTED AREA

1. A hole blasted through one of the concrete walls. 2. In removing the old foundations, the drillers were up against a hard job when they encountered this grillage embedded in concrete. 3. A mass of solid concrete within interlocking steel piling. Note the shovel marks on the soft earth at the right side of this picture. 4. Mats were placed over the dynamite charges before each shot. 5. One of the explosives magazines located at a safe distance from the blasting



OPERATIONS ON THE J. L. HUDSON COMPANY BUILDING IN DETROIT

1. Removing spoil on the first level. 2. The concrete wall that had to be brought down by explosives. 3. An electric shovel taking out blasted concrete

because there were several units erected and much more concrete, especially of reinforced type, was found than had been anticipated by the contractors.

The use of explosives in the center of the retail business section on a scale such as this job required was a novelty. At first, blasting between sunset and sunrise only was permitted, but as the work progressed without damage, continuous operations were allowed and the crews were double-shifted. The blasting contractors employed experienced men and unusual care was exercised in the work. Small charges were used and the shots were covered with mats and no one was permitted in the danger zone during the blasting. In all the work neither men nor property were injured, although thousands of people were within a short distance of the blasting operations during the day.

Contract Work and Day Labor in New York State Cities

A SURVEY of New York municipalities made by the New York State Bureau of Municipal Information shows that the prevailing practice in the construction of a municipal improvement is to have the work done by contract rather than by municipal forces. In the construction of pavements, sidewalks, curbs and gutters and sewers, a large majority of the municipalities handle the work entirely by contract. In the construction of water mains and for repair work on streets, most of the cities report the work done by municipal forces. In street grading the cities are about equally divided in having the work done by contract and by force account.

In Jamestown and Salamanca all municipal improvement work is done by the city forces. In Cortland, Kingston and Oswego, all municipal improvement work except sidewalks is done by city employees. In Watertown, all this work is performed by city forces except for large paving and sidewalk jobs. In the five boroughs of New York City, all municipal improvements except repairs are done by contract. In Lockport and Utica, all this work, except the laying of water mains, is handled by contract.

In 45 municipalities the paving and repaving of streets is done by contract and in only 10 municipalities of those report-

EXCAVATION

The excavation made for the last unit erected was 220 x 176 feet by 61 feet deep inside the pavement. This included 70,000 cubic yards of earth in addition to 4,500 cubic yards of reinforced concrete, the breaking of which required two tons of Du Pont dynamite and 20,000 electric blasting caps. An overhanging ledge of tough clay had to be blasted to save time and expense before the shovels could dig to the required depth. During this excavation 120 caissons were sunk to a depth of 120 feet.

In this 220 x 176-foot excavation, work was carried on simultaneously at three levels. Men were busily occupied at the bottom of the caissons, material was being hoisted, pumps, shovels and trucks were all working to the limit. Much credit is due the contractors for finishing the task safely and on scheduled time.

ing is this work done by municipal forces. In 13 cities, the work is done partly by contract and partly by city forces, the smaller jobs being performed by day labor and the larger jobs being done by contract. The work of repairing pavements is done largely by city employees, 50 municipalities doing this work, while in 14 cities, the work is done partly by contract and partly by municipal employees, depending upon the amount of work to be done. In only 4 municipalities is repair work done entirely by contract.

The construction of sidewalks is done by contract in 56 municipalities and by municipal forces in 5 and by both contractor and municipal forces in 7 cities.

The construction of curbs and gutters is done under contract in 49 cities, in 13 by municipal forces and in 6 both contract and city labor.

In 36 cities the laying of water mains is done by city labor, in 13 by contract and 9 partly by contract and partly by city labor.

In the construction of sewers 45 municipalities let this out by contract, 15 do it with day labor and 8 by contract and by day labor.

The grading of streets appears to be done about equally by contract and by day labor, 27 cities doing the work by contract and 29 by city labor, while 12 cities have the work done partly by contract and partly by the city.

The General "Super" Makes His First Night Visit to the Tunnel Face

By The General Superintendent, Himself



Hi! yes, this tunnel driving in rock is quite an interesting operation and presents many opportunities for the exercise of all sorts of ingenuity, as well as incessant effort to keep things going and to insure attention to safety. This latter requires the formulation of rules and regulations, which

must be everlastingly insisted upon.

That reminds me of something. You know one of the important points is to get the very most possible out of the dynamite. It is expensive and tunneling in hard rock takes a lot of it. Well, to get maximum breakage it is essential that the pasty mass should tightly fill the drill hole, as any air cushion takes away from the shock of the explosion. So one of the things impressed on the men is that the dynamite cartridge must be slit, and after being shoved down the deep hole in the rock, must be rammed home very solidly, making it swell out against the sides and thus tightly fill the hole. As one sits in the office studying the inspector's reports, noting the amount of costly gelatine dynamite used and the distance gained, one speculates as to why the results are not better, and he labors with the foremen on this and that, and especially on ramming the powder down *hard*!

Yes, yes. Maybe that night one goes into the tunnel. It is a long walk, stumbling along in the semi-darkness over the ties, slipping and splashing into the gutters and cross drains. The occasional dim lights serve only to emphasize the darkness, and make the distance seem longer. You do not ride on a stone train, much as you would like to, because that is against the rules, and you must set an example. You reflect that you are several hundred feet underground, going down hill. A little brook in the side gutter gets larger as you go on. By and by comes the sound of a pump, picking up the water and driving it past you through the steel pipe on the wall, or on the ground in the corner. Suppose some of the bad roof, supported temporarily by hastily erected timbering should collapse. It would take days maybe to get it out, and in the meanwhile the steel pipe would be broken, also the electric power lines. The water would accumulate—fill the tunnel—you would be in there with the others. Maybe there might be an earthquake. Such things have happened. You splash along, all by yourself, and it seems rather good to have a muck train roll by, and get a glimpse of a grimy face or two, and feel that they are not worrying very much.

At the face you stand around trying not to get in the way of any shovels, or stones which miss the car, or long steel drill bars going up or coming back. Somehow you begin to think that there ought to be more lights, that the ventilation might be improved; that

these men are really working pretty well, perhaps as hard as could reasonably be expected. In fact, it is a rather hard job, and quite remarkable that such strong, hardy fellows should be content to stick to it month in and month out. And how quiet they are! Is it on account of the outrageous noises of the machines making it difficult to talk, or does the work require so much energy that there is none left for words? Anyway, they seem to go on hour after hour, co-operating with each other as though they were parts of a complicated machine, and with no more need of talking to each other than the gears find for calling to the shafts or motors.

By and by it grows suddenly quiet. You look at your watch—it is 2 or 3 o'clock in the morning. The infernal din of the pneumatic drills has ceased. The muck pile has disappeared. The last train load of rock fragments (called muck for some strange reason) has rumbled off in the darkness, carrying all of the laborers with it. The drilling machines are taken away, the many drill holes have been blown out and all is ready for loading. Now, then! This is largely what you came in for and why you are here instead of in your comfortable bed. Now we will see about this dynamite business, and whether thirty dollars worth of special quality is being properly used. You move right up to where the little group is gathered at the face, the extreme end of the tunnel. All at once the electric lights go out, and nothing remains in that Stygian darkness except a couple of lanterns. You remember that the men will not handle 60 per cent gelatine, or any other per cent, for that matter, if there is any electric current around. It has seemed rather notional and foolish when you were in the office, but now somehow it rather appeals to your good sense.

You remember hearing about "stray currents," and how they have caused mysterious explosions. And suddenly you wonder what sort of weather there is tonight. Any chance of electric storms, or any special electric phenomenon? Strange how calmly these men handle these boxes of cartridges—that carrier set that one down as though it were only a keg of nails.

Now they begin to load. They work in pairs, one pokes a cartridge into the hole, the other man with a long wooden pole pushes it far into the rock, six, eight, ten feet. And when he gets it down on top of the last one, how he leans on that stick and applies a lot of power. Exactly! that's to spread the mass and fill the hole. Do you feel that sufficient force is being applied to that chained thunderbolt, that presently will demonstrate its terrific ability to shake and rend the solid mountain? *You do!* And you stand and watch. Why? Because you are afraid to move. You think of all the things that you might, could, would, and should be doing somewhere else, things that no one else can do, things that it is your duty to do, and right away too.

In fact, it is all wrong for you to be where you are when your conscience says you are needed elsewhere.

But you cannot go. You must stay and see this operation completed. A couple of hours ago you knew this was your duty to your employer, and to the "job." But that is not now the reason. Far from it. You stay now because you are afraid to go. Afraid that the men will see that you are afraid, and laugh. And worse yet, afraid that you, your own self, will point a finger at you and cry "Coward!"

So you stay and sigh with relief when the last cartridge is shoved home, when the last paper bag full of sand has filled the hole up to the collar. But wait. You must see how well and how the lead wires are connected from hole to hole. Deftly these fine wires are joined and twisted together, until there is a complete connection of all the wires from all those little fulminate of mercury devils buried in the very heart of all those masses of dynamite. Just think! One little electric impulse and such a tornado of rock as would wreck the town. What now? The foreman is attaching the circuit ends to an instrument, in which is a minute silver battery, that sends an electric current through the whole circuit, and a delicate galvanometer, if deflected, tells him that all the connections are satisfactory. Think of it! He actually sends an electric current through all that deadly mine, depending on the current to be too small to set it off.

And still you remain, trying your best to appear as nonchalant as the men, and trying to make yourself believe that you have to assure yourself that this most important part of the tunnel work is being done in the very most efficient manner. The foreman puts the galvanometer in his pocket and as all of the other men turn away and trudge off, he pulls down from the wall a line of wire to connect it with the wires from the holes. If you have had uncomfortable sensations before, they are not to be compared to the one you have now. You know that this line along the wall comes from the "firing box," a quarter of a mile away; that the switch there connects with the lighting circuit; that it might somehow collect "stray currents" from the earth. When this last connection is made you are standing beside a fearful volcano, that the slightest irregularity or imperfection means instant death, absolute physical annihilation. No place for a Moslem, eh?

What a relief! The connection is made. Beside the foreman, *pari passu*, you walk away. Not for the world would you precede him, not for all that the world holds dear would you show the slightest haste. But with every hundred feet placed between yourself and the impending eruption a load is being lifted, and how glad you are when you have measured off the accepted seven hundred feet beyond which no fragments are thrown!

For a long time thereafter no one will hear you expatiate on the failure of the powder men to ram the dynamite hard enough. If anyone else says so you will know an infallible way to get him to change his mind.

Convict Labor Menace Again Threatens Contractors

THE problem of the use of convict labor has again arisen in several of the southeastern states. There is a possibility of a fairly large group of contractors being put out of business through the recreation of this type of day labor bureaucracy, operating at wages of 10 cents a day.

Convict labor has been tried many times on highway work, and, in some of the western states, where accurate records of costs have been kept, it has been shown that it is not economical even when viewed from the standpoints of unit and ultimate costs. The *Constructor* points out "In the broader aspects of its effect on social economy, the utilization of prison labor in competition with free labor in any organized manner is known to have such widespread demoralizing results that every study of the question at once reveals its dangers."

Prison officials are usually willing to acknowledge this fact. Goods manufactured in prison contract factories demoralize markets and force free industries to compete at wage levels that are ruinous to the buying power of its workers.

When groups effected protest, their arguments are usually so well founded as to cause such prison labor exploitation schemes to be dropped. Hence, the prison official is in a constant quandary as to what should be done with the convicts under his care. To keep them in idleness is demoralizing to his charges. To put them through such silly routine operations such as breaking stones, and wheeling sand back and forth is futile and mentally depressing. Furthermore, maintaining prisoners costs money.

It is the systematic organization of day labor machinery for the regular use of prisoners on highway work that is so alarming in Virginia and which appears to be so attractive to state officials in a few other states. The building up of a prison labor machine through which the greater part of the highway expenditures of a state are being or may be expended is a policy that will demoralize not only the business of highway contractors, but will affect the standards of living of thousands of workers, their dependents and the communities in which they exist.

The occasional practice of individual contractors making use of convict labor by special arrangement with the prison authorities has made possible the training of a sufficient number of convicts to make the organization of a day labor convict system attractive to authorities. If the highway contractors of these and other states are to take the correct stand in resisting such unwise encroachments, they will necessarily have to unite in a definite policy of employing free labor only. Their interests, the interests of their workmen and of their communities are identical in this situation.

The recent program announced in North Carolina and the trends that are to be observed in South Carolina and Alabama are not only to be deplored, but require effective action, if they are to be combatted.

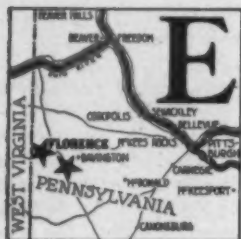
Pennsylvania Cities May Now Weld Buildings

AN increase in the use of welding in the construction of buildings in the state of Pennsylvania is foreseen as a result of the passage of a law in that state, allowing this type of construction to be used in first class cities. This new law gives in detail a building code for cities of the first class and in this code is a section giving permission to commissioners of buildings in such cities to adopt welding as an erection method.

Welding as a method of construction is on the increase and at least 50 buildings throughout the country have been built by this method. One of the largest of these is a factory building constructed by the General Electric Co., in Philadelphia. The process is now removed from the realm of experimentation and is being established as a satisfactory method for construction efforts, not only in structural work but in other fields as well.

Many municipalities are at present revising their building codes to permit the erection of welded buildings, and it seems likely that more and more will adopt this method of construction. As the new Pennsylvania law applies only to first class cities, municipalities below that grade are free to adopt their own codes.

Elevating Grader Used Successfully on Rough Grading for 13.3-Mile Brick Paving Job



EARLY in the spring of 1928 the Pennsylvania Department of Highways awarded two contracts, covering the construction of the remaining unimproved sections of the William Penn Highway, U. S. Route 22, west of Pittsburgh. This section is 13.3 miles in length, extending from the

Allegheny-Washington County line through Florence to the Pennsylvania-West Virginia State line, and upon completion will provide a direct route from Pittsburgh to Steubenville, Ohio, and points west.

The type of pavements authorized for both of these projects was fire clay cut lug brick with cement sand cushion on a plain concrete base.

The first section, 7.95 miles in length, designated as Route 257, Section 1, was awarded to Lewis & Copeland, Lima, Ohio. The major items of work consisted of approximately 201,500 cubic yards of Class 1 excavation, 84,000 square yards of subgrade, 83,800 square yards of plain concrete base, 18,500 square yards of fire clay brick pavement, grouted, and 56,100 square yards of fire clay brick pavement with bituminous filler.

GRADING

B. A. Jacobson, as subcontractor, furnished the grading organization, composed of one Northwest and one Osgood $1\frac{1}{4}$ -yard gas shovels and two Austin-Western elevating graders, a shovel crew consisting of five men, three 6-60 Best tractors, four La Plante-Choate 5-yard steel dump wagons, and either an Austin or a Huber 10-ton gas roller. A grader crew consisted of 5 men, 11 mule teams, a tractor and a roller.

All the material excavated was loaded, hauled to the fill section and spread in 8-inch layers, loose. In fills over 10 feet in depth and on which the contractor desired to place pavement the same season, the layers were 4 inches in depth. All layers were thoroughly rolled. No side casting or wasting of material was permitted, and all excess material was used to widen the fills. An analysis of the material encountered was approximately: earth 30 per cent, clay 5 per cent, soft shale 45 per cent, hard shale 15 per cent, and rock 5 per cent.

The successful use of an elevating grader on material of this type, and more particularly because of the rough topographic conditions encountered, was regarded as doubtful by many. Skilled operators, and an intelligent disposition of the two, resulted in the successful moving of over half the excavation on this project. All but the hardest shale and rock was readily handled. Where an isolated boulder or a short section of rock was encountered the elevating graders were usually able to work

around or over these for a number of trips, uncovering them sufficiently to permit their removal by sledging or blasting. Where hard shale or rock was found in quantity the grader was moved to the next cut, leaving the shovels to complete the work.

With the use of the elevating graders it was possible to cut very close to grade, minimizing materially the work required in fine grading. Very little additional work was required in trimming the slopes. While no accurate information is available, it was not unusual for a grader to move approximately 1,000 cubic yards of excavation in a day.

It was estimated that it would require six $\frac{3}{4}$ -yard shovels 125 working days to complete the grading on this contract. The subcontractors' two $1\frac{1}{4}$ -yard shovels and two elevating graders completed the work in approximately 85 working days. From this it is apparent that an elevating grader with a skilled operator and efficient supervision can be advantageously used in conjunction with shovels on highway work such as is encountered in western Pennsylvania.

FINE GRADING

Extensive use of a Lakewood subgrader, a 3-30 Best tractor with grader, and a Hadfield-Penfield power maintainer enabled a foreman and 10 common laborers to prepare approximately 700 feet of subgrade each day. Three additional men were required to set forms.

PLAIN CONCRETE BASE

The plain concrete base course specified was 1:2:4 concrete 18 feet in width, having an 8-6-8-inch section with a 1-inch parabolic crown and a $3\frac{3}{4}$ - x 12-inch header curb along either side. Slag or gravel was specified as coarse aggregate in the base course proper, slag or stone being required in the header curbs, which, of course, formed a part of the wearing surface. Proportioning was by volume, and light two-batch trucks were used in transporting batches to the mixer. A solution of calcium chloride having a minimum specific gravity of 1.31 was used as a curing agent, 0.39 gallons of this solution per bag of cement being added.

The paving organization consisted of one foreman, a mixer operator, finishing machine operator, three hand finishers and six pit men. Three common laborers were used in placing burlap and sprinkling. The integral curb required two additional finishers, four common laborers to set curb forms and four additional men carrying back concrete. A crew of approximately 12 men were used in banking the edges of the previous day's run. The same equipment must be used and equal care and good workmanship exercised in the finishing of the base as for a concrete riding surface, and this is particularly true of the curb. A total of 36,703 square yards of base was placed during 1928 in 37 working

days, or an average of 990 square yards per working day. As yet no brick has been placed on this section.

WORK ON SECTION 2

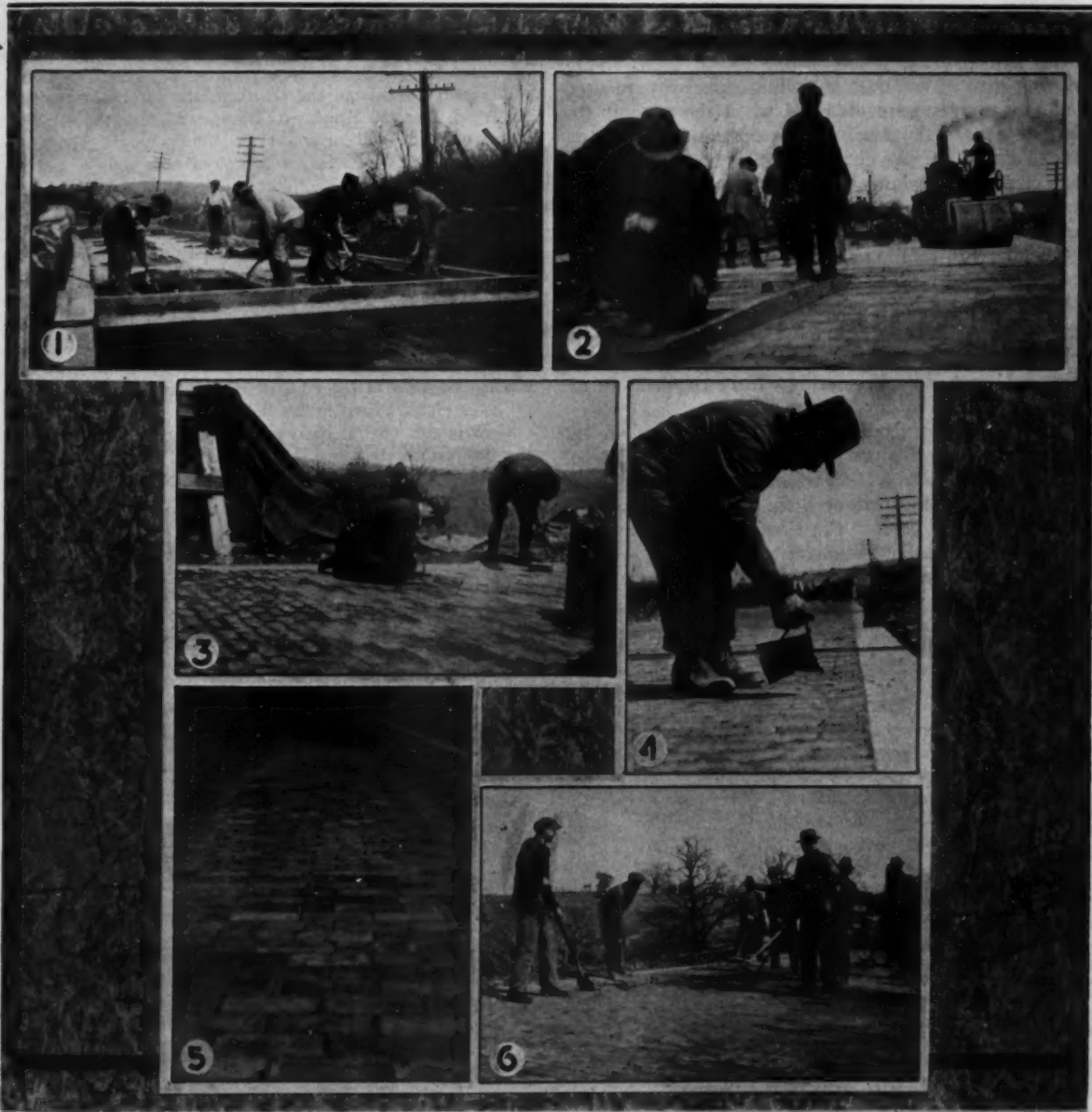
The remaining portion, 5.35 miles in length, designated as Route 257, Section 2, was awarded to Corrado & Galiardi, of Connellsville, Pa. The major items of work consisted of approximately 104,900 cubic yards of Class 1 excavation, 56,100 square yards of subgrade, 55,900 square yards of plain concrete base, 4,450 square yards of fire clay brick pavement, grouted, and 45,200 square yards of fire clay brick pavement with bitum-

inous filler.

This contract also included a part of Route 115, designated as Section 6, about 1.7 miles in length. The quantities for this are not included in the above figures, as the type of pavement was reinforced concrete.

FILLING BRICK JOINTS

The Pennsylvania Department of Highways specifications covering the filling of joints with bituminous material reads: "The asphalt filler shall be applied immediately after removing from the kettles by the following methods: The joints shall be filled by means



BRICK PAVING OPERATIONS ON THE WILLIAM PENN HIGHWAY

1. Mixing the cement-sand cushion on the concrete base. The templates and cushions are seen in place in the foreground. Note that the template is drawn on hardwood liners.
2. Diagonal rolling of the brick and testing the rolled surface with a 10-foot straight edge. Low bricks are pulled and raised while high ones are tamped to grade or pulled and lowered.
3. Lowering a brick. The flame thrower on the right is used to dry joints before pouring.
4. Resealing the last operation before sanding.
5. A section of completed pavement before sanding. Note the freedom from excess filler.
6. Method of removing excess filler in cold weather with concrete spades.

of approved pouring cans. A slight excess should be poured into the joints and the filler must not extend beyond the width of the joints."

The object of this provision is to insure a joint filled to the bottom and to provide a surface bare of filler which will not become slippery in wet weather. Repeated inspection of joints poured in cold weather by removing bricks, found the joints filled to the bottom. Because of the surface over which the asphalt is spread with the resultant rapid cooling, a joint completely filled is extremely difficult to obtain where the squeegee method is used.

A crew of 16 common laborers, one bricklayer, one roller, one operator and foreman unloaded the brick, prepared the cushion, and placed and rolled the surface. For pouring joints 17 men were used. Small pouring cans of not over $\frac{1}{2}$ -gallon capacity were used, and best results were obtained when the asphalt was heated to near the maximum temperature of 400 degrees Fahrenheit. An auxiliary heater of small capacity that can be kept along with the men was found to expedite pouring. Certain sections were allocated to each man, with several of the best men assigned to follow up, retouching and refilling spots where the filler had been omitted or had receded too low.

The cold weather encountered since this work started has permitted the ready removal of surplus asphalt the following morning by the use of concrete spade. A great deal more care in pouring will be required during warm weather.

The above organization has thus far averaged 180 linear feet of surface per day, with a maximum of 267 linear feet in one day. Short days, fall weather, and an organization inexperienced in this type of work is partially responsible for the slow progress. It is believed that the same organization with good weather and additional experience can place 400 linear feet of surface per day.

The average cost of pouring the joints by hand on this contract to date has been 18 cents per square yard. From a traffic standpoint the resulting surface with

joints poured in this manner is very superior to pavements on which the squeegee method of filling joints is used because of the better traction in wet weather.

Eleven and One-Half Stories Added to Steel Structure

IN Birmingham, Ala., there was, until the early part of 1928, at the corner of First Avenue and 21st Street, a 3-story steel frame building which had been built for and used by a newspaper as its office and publishing plant. The foundations and the framework of this building were designed with the intention of adding, at some future date, nine stories above the three original floors. Through a newspaper consolidation, the building was no longer useful for its original purpose. It was placed on the market and acquired by the Protective Life Insurance Co., of Birmingham.

In order to enlarge the structure the insurance company employed Warren, Knight & Davis, architects of Birmingham, to design and supervise the construction. The architects called in W. C. Spiker & Co. of Birmingham and Atlanta, as consulting structural engineers.

Plans were prepared with the ultimate possibilities in mind. Modern practice in steel design and the use of special floor construction and light weight tile fire proofing to minimize the dead load permitted these plans to show eleven and one-half added stories including a high-ceiling auditorium on the fourteenth floor. The effect of this increased height was to augment the wind stress originally allowed for in the lower story columns. Accordingly, the plans called for reinforcing the original columns at the ends of the building by the addition of cover plates affixed in the field.

Construction on this basis was checked by and approved by the Birmingham Building Department and was started March 5, 1928, with Foster & Creighton Co., Nashville, Tenn., as general contractors. The new steel work, amounting to 375 tons was furnished by the Ingalls Iron Works Co., and erected by the James H. Elkins Construction Co., of Birmingham in 28 working days. The entire building was completed and certificate of occupancy issued September 11, 1929, with a total of fourteen and one-half useful floors available. This date was nine days in advance of the contract date, thus serving to illustrate the speed of construction possible when a steel skeleton is used.



DIRT HANDLING IN THE GRADING OPERATIONS AT THE NEW YORK CITY MUNICIPAL AIRPORT AT BARREN ISLAND

W. E. Flanagan, Contractor, Brooklyn, N. Y., who had the grading contract for this job, moved 342,000 yards of sand in 150 days. This sand had to be transported over hydraulic fills which in some cases were under two feet of water. Mr. Flanagan reports that with the Biehl creeper-wheel wagons, hauled by Monarch tractors, he moved as much as 600 yards of sand per wagon per 10-hour shift using one tractor to a wagon. With the round wheel wagons it took three tractors and three wagons to move this same amount of material. It was found also that the crawler type of wagon with a 10-yard water level capacity required less gasoline for the tractor than a single round wheel wagon of 5-yard water level capacity.

Are There Objections to Prequalifying Bidders?

Philadelphia Bureau of Municipal Research Makes Study to Determine Whether Eligible Lists of Bidders Based on Questionnaires Are Proper



THE March, 1929, bulletin published by the Philadelphia Bureau of Municipal Research, discussed the prequalification of bidders and a number of advantages of prequalification were shown. Later, when an ordinance was before the Philadelphia City Council, and when a bill was awaiting the Governor's signature which would permit the city to reject bids for public works contracts from contractors who had not qualified in advance of the taking of bids, the Bureau published another bulletin stating objections to pre-qualifying contractors, based upon questionnaires concerning the contractor's experience, finances and equipment. It is this second bulletin from which the following material is taken.

QUESTIONNAIRES TOO COMPLICATED?

One objection is that questionnaires are too complicated. For large concerns the objection would have no weight. They must keep complete records, but it is said that a surprising number of the smaller contractors have incomplete and perfunctory records. To such, an accurate response to a definite set of questions would doubtless loom large and discouraging. It would seem, however, that men with sufficient responsibility to enter any commercial field, should keep books—for their clients' sake, if not for their own. If the questionnaires do no more than promote the general use of proper accounting methods by contractors, they might be well worth while.

TIME AND LABOR REQUIRED

Another objection is that filling out so many questionnaires would involve undue expenditure of time and labor. This may be due to a misconception. It is not necessary for a full set of questionnaires to accompany each bid. Ordinarily, one experience questionnaire a year submitted when the lists of qualified bidders are being compiled would be sufficient. Financial questionnaires should be needed only twice or at most four times a year from those on the eligible list, with a current statement from the contractor to whom the award is about to be made, and an equipment schedule for the job in question should be filed with each bid. At the most then, there should be needed one experience and four financial statements in the year, an equipment statement with each bid, plus a current financial statement from the contractor to whom an award is to be made.

PREQUALIFICATION SHUTS OUT NEW BLOOD

It is argued that prequalification will shut out the small man and beginner and restrict the field to large and rich concerns, but practically all construction men begin in a humble capacity with some already responsible organization and there acquire the training and experience for independent work. Under prequalification such men would be welcomed in the lower classifications and how far they would advance would depend upon themselves alone. To have the fitness of the ambitious passed upon by an impartial body protects not only the public but the men themselves by preventing the premature assumption of burdens which might crush them. Prequalification is but an extension of the principle applied to the professions where the possession of theory and practice must be demonstrated by the applicant and attested by diploma and state board and in the trades where those who would be masters must serve apprenticeships.

REDUCES COMPETITION

Would prequalification reduce competition? If prequalification is needed at all, it should at first reduce competition to a certain extent, but it is important to remember that there is undesirable, as well as desirable competition. Engineers and contractors alike agree that whatever the bid price, it is less expensive to have work done on time in a workmanlike manner than to have it drag or be done carelessly. Acceptance of a low bid from an incompetent contractor is likely to result in delay in the use of the improvement, delay to other work, lawsuits and other trouble, while inferior construction may result in high maintenance costs, early decay or even actual failure. Experience indicates that the removal from competition of the irresponsible encourages bids from contractors of the better class who have previously refused to compete. If inferior men had been bidding previously, prequalification should, at the outset, reduce the number of bidders, but the reduction would probably be only temporary.

PREQUALIFICATION WOULD BE ABUSED BY OFFICIALS

Some feel that prequalification would increase the opportunities for officials to "freeze out" the successful competitors for political favorites. This feeling is not justified. At present the awarding official can reject an "irresponsible" bidder with or without questionnaires. He alone decides the question after the bids are opened. With prequalification, there is documentary evidence upon which the decision as to responsibility is based. This protects both the official and the contractor. Further, when the eligible lists are being made up, the question of responsibility is not complicated by

the bids, and to the benefit of all concerned, is then more likely to receive cool and unbiased judgment than would be the case after the bids are known.

INVASION OF PRIVATE AFFAIRS

It is objected by some that the questionnaires invade a contractor's private affairs. Such an objection would not be raised by a contractor to his bank's investigation, nor should it be regarded as valid by an official responsible for the expenditure of the people's money. Only under exceptional circumstances would the information be accessible to others than the officials required to pass upon it. With this assured, the objection fails to impress.

Sacked Concrete Used to Fight Floods

AN interesting use of sacked concrete was made in fighting high water in the construction of the Redwood Highway, California, a description of which appeared in the April issue of *CONTRACTORS AND ENGINEERS MONTHLY*. The particular part of the road along Shively Bluff in Humboldt County has been a source of extreme trouble either from slides or from the wash of the Eel River on the embankment side of the roadway, and the spring of 1928 found the roadway at this point washed out until two cars could not pass.

A study of the situation, according to *California Highways and Public Works*, revealed that 8,500 cubic yards of material were necessary to fill out the roadway to its standard width, and that probably 100,000 cubic yards would have to be moved to get the roadway to a cut section which would be safe. This would also open up a new face, probably 100 feet high, which would cause many new slides. After a consideration of various methods of repair, it was finally decided to refill the embankment which had been washed out and protect it against the river which rises, in flood times, about 25 feet and carries very heavy drift.

The season was getting late so the proposition of filling the embankment and slope paving was abandoned in favor of sacked concrete rip rap, as high water was expected at any time and with the use of this method the fill and rip rap protection could be brought up at the same time. Accordingly a trench was dug about 2 feet deep in bed rock at the cross-section toe of fill, the first sack laid lengthwise, and the second row placed crosswise, to render better stability to the footing. The third row, as well as the balance of rows for the entire height, was placed lengthwise again, or parallel to the grade.

Experience has shown that a better bond can be secured by lapping the sacks to approximately half their width, giving about a 1:1 slope to the finished wall. The wall should be brought up in sections and as the concrete is mixed comparatively wet, the handling of the sacks promotes a kneeding action which brings a film of grout to the outside of the sack, promoting a permanent bond between sacks when laid. When a row has become set, a trench about 8 inches wide should be dug immediately behind the cold row and filled with concrete, before the succeeding row is placed. Slope boards should be constantly employed to keep the slope true to line and care must be exercised to keep the rows from working out as wheeling over them tends to mush them towards the outside.

Two mixers were set up on grade, and a hopper built immediately below the mixer where two men loaded sacks with concrete, tied them and shot them to the wheelers and placers by means of troughs. From this point they were wheeled in wheelbarrows to the point of placing, over 2-inch boards laid on the newly placed concrete sacks. The fill was brought up with the assistance of a team and Fresno.

This rip rap was 370 feet long and 25 feet high, being

"toed in" to the old ground on either end. A total of 550 cubic yards of concrete was mixed and placed, one cubic yard covering 2.7 square yards of surface.

The sand and gravel was hauled from a river bar by a 1½-cubic yard truck and dumped at the mixers close enough so that it could be shoveled directly into the skip, proportionately by shovel counts, so that no wheelbarrows were necessary. Material was loaded from the bar by a one-man gravel plant consisting of a small hoist and bucket which dragged the material up a runway and dumped into a loading box. Mixing water was furnished from a pipe line and small pump set in the river.

Ordinary small grain, potato or sugar sacks which have an open mesh were used. The sacks were tied with wire close to the concrete so that a maximum rise per sack was obtained when they were placed in the row.

This rip rap has stood up very well through the winter, only two slips having developed and these were easily aired. The work was designed and the construction supervised by Richard H. Wilson, District Maintenance Engineer.

Safety Code for the Construction Industry

TO reduce the rising mortality among workers in the building trades a Safety Code has been compiled by the American Institute of Architects and is to be made available for adoption by contractors. The Code is a comprehensive effort to formulate safety regulations for the building industry in this country and has been in preparation for over a year.

It is reported that more than 2,000 construction workers are killed each year, ten each working day. This death rate is higher than in any other industry, except mining. Most states have reported considerable increase in accidents among workers on buildings during the past few years. New machinery and mechanical equipment and speed-up methods are largely responsible for this, in addition to the absence of a definite set of safety measures, which means that both contractors and workmen take undue risks.

The idea of safety codes and precautions in construction is growing rapidly and seven states now have safety codes on their statute books for the protection of construction workmen. Fourteen states have a few legislative regulations and twenty-seven have no regulations at all. However, legislative action does not insure safety. Far better results can be looked for from voluntary action on the part of the contractor, combined with increased carefulness on the part of the worker, and with the support of the architect.

In compiling this Safety Code for the construction industry, existing sectional safety codes were carefully studied and all varieties of hazards of construction work were considered. In addition to regulations for meeting these hazards, the committee prepared, in an abridged form, a set of rules and warnings for workers which contractors are recommended to hang in the form of posters on all buildings in the course of erection and demolition.

Engineer or Engineman?

A CONFERENCE was held recently at the New York offices of the American Society of Mechanical Engineers to discuss the terms "engineer" and "engineman." The purpose of the conference was to prepare a statement of not over 50 words which could be submitted to the Bureau of Census as a guide for the census enumerator to decide upon the proper designation of those who might claim to be engineers. The following statement was agreed upon.

"The engineer is a man or woman of professional training or experience who applies engineering principles to research, design, construction, operation or production or who imparts technical instruction in these fields. The professional engineer must be carefully differentiated from the machine or engine operative."

Who's Who in Construction

A Series of Reports from Active Contractors Published Monthly

BUS. VOL.—ANNUAL VOLUME OF CONTRACTS

- A—Over \$5,000,000
- B—Between \$1,000,000 and \$5,000,000
- C—Between \$500,000 and \$1,000,000
- D—Between \$250,000 and \$500,000
- E—Under \$250,000



H. W. Hansen

H. W. Hansen, Council Bluffs, Iowa, 606 South Main Street. Organized: 1922. This company was originally Anderson Brothers & Co., contractors and builders, which was bought out in 1916 by D. N. King and H. W. Hansen and then became King & Hansen. In 1922 Mr. King sold out his share to Mr. Hansen who now conducts the business alone. Officers: H. W. Hansen, owner. Type of contracting: building.

Carroll-Sharp Construction, Ltd., Toronto, Can., 43 Scott Street. Branch offices: Ridgeway, Ont., Can. Yards, Leaside, Ont., and Ridgeway, Ont. Organized: 1929. This company has been formed for the purpose of carrying on a general contracting business, specializing in the installation of waterworks, sewers and sewage disposal plants. These officers of this company have for the past several years directed the affairs of, and still control, F. F. Fry, Ltd. Officers: J. G. Carroll, President; Louis E. Carroll, Vice-President; George W. Sharp, Secretary and Treasurer. Major contracts: watermains, Thorold Township, Ont.; sewage installation, Crystal Beach, Ont.; watermains, Glencoe, Ont.; sewers, Bridgeburg, Ont.; waterworks, Sick Children's Hospital, Thistletown, Ont.; sewers, Fort Erie, Ont.; watermains, Bertie Township, Ont.; storm relief sewer, St. Catharines, Ont.; sewers and watermains, Canadian National Railways, Toronto, and sewers, Thornbury, Ont.

M. Osborn, Sea Girt, N. J., Baltimore Blvd. Organized: April 1, 1921. Bus. vol. E. Officers: M. Osborn, owner. Type of contracting: excavating, grading, sidewalks and gutters.

United Fireproofing Co., New York, 8 West 40th Street. Organized: 1909. Bus. vol. B. Officers: James D. Dusenberry, President; Charles Dusenberry, Jr., Vice President; Edward Leech, Treasurer; Charles W. G. Baiter, Secretary. Type of contracting: general. Recent contracts include incinerator plant for Brooklyn Ash Removal Co., \$1,500; Lido Club Hotel, Long Beach, L. I., \$2,500,000; publishing plant for Methodist Book Concern, \$1,000,000; swimming pool and bathing pavilion for Atlantic Beach Castles, Atlantic Beach, L. I., \$300,000 and a factory for Laurenceville

Realty Co., Woodside, L. I., \$300,000. This building was awarded a prize from the Chamber of Commerce, Borough of Queens, for excellence of design in industrial buildings erected in Queens Borough in 1926. Member N. Y. Building Congress.



Edward Leech



J. D. Dusenberry

James Stewart & Co., Inc., New York, 230 Park Avenue. Branch offices: Philadelphia, Chicago, Buffalo and Tokio. Organized: 1913. Bus. vol. A. This company was originally organized in 1845, and represents continuous activity since that time in 45 states of the United States, Canada, West Indies, South America, Great Britain, France and Japan. Officers: Alexander M. Stewart, Chairman; James C. Stewart, President; Henry W. Lohmann and Harry D. Watts, Vice-Presidents; L. V. Heuser, Secretary and Treasurer. Major contracts: 1926, Madison Square Garden, New York; 1927, Barnett National Bank, Jacksonville, Fla.; Masonic Temple, New Orleans, La.; 1928-1929, New York Central Building, New York; Mitsui Main Bank (the largest individual banking house in the world), Tokio; 1929, New Amsterdam Casualty Bldg., New York, Curtiss Aeroplane & Motor Co. Plant, Buffalo, N. Y., Pennsylvania Railroad Office Building, Philadelphia, and West Side Express Highway, New York.



Photo by Blank & Steller

H. D. Watts

John Loncaric Contracting Co., St. Louis, Mo., 11 N. Eighth Street. Organized: 1912. Bus. vol. E. Officers: John Loncaric, owner. Type of contracting: general masonry, including bricklaying and cut stone on buildings.



Photo by Blank & Steller

M. Nieuwenhou

Nieuwenhou Co., Inc., New York, 51 Madison Avenue. Organized: 1919. Bus. vol. A. The Nieuwenhou family has been engaged in the construction business since 1872. Officers: Mathias Nieuwenhou, President; Siebrand H. Nieuwenhou, Vice-President; John J. Prendergast, Secretary; Charles J. Fahrenkopf, Treasurer. Major contracts: Rockland State Hospital, Orangeburg, N. Y., \$7,801,000; Bronx Wholesale Terminal Market, New York City, \$3,000,000; Concourse Plaza Apartment Hotel, New York City, \$2,500,000; Mount St. Michael's Institute, New York City, \$750,000.

E. D. Camomile, Hollywood, Calif., 1777 North Highland Avenue. Branch office: 1321 Virginia Avenue, Glendale, Calif. Organized: October 6, 1928. Mr. Camomile acted as General Manager for the De Luxe Building Co., Los Angeles, from 1919 until 1928, when he organized his own business. Officers: E. D. Camomile, owner. Type of contracting: fine residences. During Mr. Camomile's career he has built homes for John Barrymore, Dolores Costello, Mary Pickford, Harold Lloyd, Mary Astor and Tom Mix.

Harrison & Dean, Inc., Huntington, W. Va., 2840 Third Avenue. Organized: 1905. The company was incorporated on May 14, 1913. Bus. vol. E. Officers: C. O. Harrison, President and Treasurer; F. E. Dean, Vice-President; A. J. Baxter, Secretary and Superintendent of Construction. Type of contracting: paving, grading, excavating, waterworks, sewers, state road work, railroad and concrete construction work.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own

attorney

Edited by A. L. H. Street, Attorney-at-Law

Law Precludes Rejection of Public Work

A Kentucky statute, empowering city councils to require municipal contractors to complete jobs according to contract or to modify estimates of cost, does not permit rejection of work of substantial value because of defects therein, held the Court of Appeals of the commonwealth in the case of *City of Earlington vs. Powell*, 10 S. W. (2d) 1060, decided November 20, 1928. In part, the opinion reads:

"It is argued that the statute confers upon the council the exclusive function of deciding when an improvement contract has been performed or breached, and that the discretion thus vested is beyond the control of the courts, in the absence of fraud or collusion, as is true in the present case. We have often held that the acceptance of the work by the city council is final, unless fraud or collusion is found.

"But the statute does not empower the council to reject work of substantial value for mere defects or insufficiencies not amounting to a total failure to perform the contract. It plainly contemplates that the council may require specific defects to be remedied, and insufficiencies supplied, or it may modify the cost to conform to the facts, or it may do both, if the exigencies demand it. If the statute should be construed to authorize one party to a construction contract to reject the work entirely and make its action conclusive, it would place arbitrary power in the hands of that party. A construction leading to such consequences should, if reasonably possible, be avoided."

Uncertain Meaning of Contract Caused a Lawsuit

Whoever drew a road grading contract—whether lawyer or layman—furnished the fodder for the lawsuit of *Nixon vs. Robert C. Lassiter & Co.*, 119 So. 17, finally decided by the Alabama Supreme Court December 20, 1928.

Defendant contractor agreed to pay the plaintiffs, as subcontractors, 30 cents per cubic yard for "grading, including subgrading and finishing the shoulders," on a certain highway job. Dispute arose as to whether yardage for subgrading and shouldering was to be paid for. The trial court decided in favor of plaintiffs and, at first, the Supreme Court upheld that decision, but, on rehearing, it reversed the lower court and decided in favor of defendant. On rehearing the court said,

"The appellate [plaintiff subcontractor] knew at the time the contract was made that appellant [the general contractor] had a contract with the state for grading, and that it was the interpretation of the State Commission that such contract for grading included as an incident thereto the subgrading for which no pay was provided, and knew that the contract with the state was for thirty cents per cubic yard. It is our view now, upon further consideration, . . . that there is an ambiguity in the meaning of the contract. It is uncertain upon the face of the contract whether the words 'including subgrading and finishing the shoulders,' means that such work is included in and is a part of the 'grading,' or whether they mean that for such subgrading appellant was to pay appellee at the rate of thirty cents per cubic yard in addition to other grading. . . . And it is our judgment that considering the facts surrounding the parties, the ambiguity should be resolved in favor of appellant."

Highway Contractor's Bond Covered Camp Bills

A contractor on a state highway job in South Dakota bonded himself to pay "all just claims for materials, supplies and labor, and all other just claims incurred by him or any of his subcontractors, in carrying out the provisions of this contract."

In a decision handed down by the South Dakota Supreme Court January 5, 1929, in the case of *Finch vs. Enke*, 222 N. W. 657, it was held that this bond covered groceries, meats, etc., furnished a subcontractor's road camp and consumed by his workmen on the job, and that it also covered dishonored checks given by a subcontractor for such supplies and for wages. Part of the court's opinion reads:

"Many courts, including the United States Supreme Court, hold that groceries, provisions, supplies, etc., furnished a contractor for public work, and necessarily used and consumed by the men during the progress of the work, are materials within the meaning of a statutory bond conditioned for the payment of all labor or materials used in the performance of the contract. . . . As pointed out by this court in *March v. Butler* (S. D.) 220 N. W. 461, 'supplies' is a broader and more comprehensive term than 'materials.' . . .

"However differently other courts may construe other bonds in the light of different conditions, we are of the opinion that one who, in 1924 became surety for the performance of a contract for building a state trunk highway in South Dakota may fairly and reasonably be held to have contemplated that groceries, meats, and provisions would be furnished to the contractor's road camp and consumed by the men in doing the work, and that claims therefor would be incurred by the contractor and his subcontractors in carrying out the provisions of the contract. We are of the opinion that a surety otherwise liable should not escape liability merely because—for aught that appears to the contrary—the highway might have been built without the contractor himself feeding the men. We therefore conclude that the failure to allege the indispensable necessity on the part of the subcontractor to board his men did not render the first four causes of action demurrable."

Time for Performance as an Element of Competitive Bidding

In the case of *Deutsch vs. Oklahoma City*, 270 Pac., 851, decided September 18, 1928, the Oklahoma Supreme Court passed upon questions as to whether a bridge construction contract had been awarded by defendant city in accordance with the legal requirements for competitive bidding. A summary of the court's conclusions is as follows:

To constitute competitive bidding, the time for completion of a contract is made an essential element in the proposals or bids upon the work to be done.

The plans and specifications did not provide a time limit within which the work was to be completed, but did contain a provision making the advertisement or notice to bidders a part of the contract of the successful bidder. The advertisement or notice to bidders fixed the time limit for the completion of the work at 200 working days. The time limit placed therein was sufficient to constitute competitive bidding.

LABOUR

Centrifugal Self-Priming PUMPS

Rendering an appreciated Service for E. J. Albrecht Contractor, Chicago.

OUR picture this month was photographed in Grant Park, near the Lake front, just about due east of the Stevens Hotel, Chicago.

It shows a LaBour Portable Centrifugal Self-priming pump lifting water from 1 foot below lake level to an embankment 25 feet above lake level, and through a 400 foot length of 3 inch linen hose.

Mr. P. W. Joy, Job Superintendent for E. J. Albrecht, contractor, said, "Our two LaBour pumps are doing excellent work, and we keep them busy practically all the time. You will be interested in one case where one of their pumps handled a

Straight 29 Foot Lift

"It was in a deep shaft of a Sanitary District diversion chamber, at Main Street and McCormick Road, west of Evanston. We attached 20 ft. of 4 in. suction hose to 12 ft. of 4 in. iron pipe, with foot valve. And, to our amazement, one day last July, we saw your pump actually handling a straight lift of 29 ft.—pumping sewage! And it quite regularly handled a 25 ft. lift in this work.

"Another instance: this same pump actually emptied 4 miles of 6 ft. 6 in. concrete sewer which was completely filled with sewage, in three days. This was the North Shore sewer of the Sanitary district, running from the Howard St. pumping plant to Wilmette. The water was pumped out of a manhole at an average lift of 25 ft."



CENTRIFUGAL SELF-PRIMING

A revolutionary type of pump, strongly patented, and exclusive with us. Once called a "freak," it is now the DOMINANT CONTRACTORS PUMP; in such widespread demand that we have had to move to a new plant three times our former producing capacity.

No floats or valves are used in LaBour pumps and no external priming devices. Our patented Impeller—the only moving part—together with the casing in which it operates, takes the place of all such complications.

LaBour pumps are offered in a range of sizes, for portable or stationary installations; from our own stocks, or by contractors supply houses.

Send for Bulletin 29-C

THE LABOUR COMPANY, Elkhart, Indiana

Sassing the Boss

There is no law that says just how far one holding a subordinate position in a contracting business can go in the matter of letting his superior in authority know what uncomplimentary notions he has of the chief, without affording ground for discharge under a contract providing for a term of employment remaining unexpired.

But a recent decision of the Arkansas Supreme Court outlines some of the conditions under which a summary discharge is or is not justified on the ground of insubordination. (11 S. W. 2d, 473.)

Following what courts throughout the country have frequently decided, the court holds that an employee—and in this regard subordinate officers of a company to be understood as being "employees"—is bound to refrain from insubordination and the use of disrespectful language toward his superior or employer. But acts reasonably provoked by misconduct on the part of the boss are not to be regarded as justifying dismissal. To illustrate, if an employer or superior were to apply to a subordinate an ugly epithet which commonly causes men to fight, it would seem that knocking the boss under anger induced by the insult would not afford legal ground for refusing to permit the employee to remain in service until termination of the agreed term of his employment.

And, as noted by the Arkansas court, whether a given bit of rough behavior may be said to be such insubordination as will justify termination of an employment contract depends somewhat upon "the social status and environment of the parties." A bit of bluntness on the part of a janitor which might justify his being "canned" might not warrant "giving the air" to a superintendent or manager. And when the employee happens to be a stockholder, director and official of an incorporated business his superior must not be too thin-skinned when they get into jars. Nevertheless the fact that the employee is a stockholder and director does not preclude his discharge for insubordination. Even he must be somewhat more circumspect and respectful towards his superiors than the average traffic policeman is toward the sovereign citizen.

This discussion applies, of course, only to employments for definite and unexpired periods of time. Where employment is not for any definite time an employee is just as much subject to summary discharge for being too polite as he is for being too impolite.

Gravel Pits, Quarries, Etc., in Cities as Nuisances

The right of a city to restrain the excavation of rock, gravel, etc., for commercial purposes in a residential section of a city was recognized in a Los Angeles case disposed of by the California District Court of Appeal January 9, 1929 (People vs. Hawley, 272 Pac. 1076). On the general aspects of the subject, the court said:

"The reasonableness of any legislative act under the police power is presumed when it appears upon its face from common knowledge of its subject-matter to be reasonable. If it does not so appear, any one attacking its validity must plead and prove facts showing that it is unreasonable. . . .

"It is not apparent that forbidding the operation of steam shovels or the excavating of deep holes in a residence district is an arbitrary or unreasonable regulation; on the contrary, it would appear that such operations might easily depreciate or destroy the value of such a district for residence purposes and render ineffective the zoning ordinance.

"It was, therefore, incumbent upon the plaintiff to allege and prove such facts and circumstances as would show the arbitrary and unreasonable application of the ordinances under existing conditions. The plaintiff claims that the enforcement of the ordinance will result in the taking of its property without due process of law by prohibiting its most valuable use. The right to a beneficial use of private property, however, has always been held subject to such limitation as the state, in the exercise of its police power, may lawfully impose."

Paving Maintenance Bond Exempting Against Defects of Old Base Held Not to Exempt Against Smoothness of That Base

An Arkansas paving maintenance bond exempted against liability for repairs necessitated by defects in the old base used in the improvement. This exemption did not extend to repairs necessitated by smoothness of the old surface, held the Arkansas Supreme Court in the case of Connelly vs. Beauchamp, 13 S. W. 2d, 28, decided January 28, 1929. Interpreting the exemption provision of the bond, the court observed:

"We agree with the appellant that it is proper to consider both the construction contract and the construction bond together with the maintenance bond. And when so considered, it is too plain for argument that the parties meant in the maintenance bond a defect occurring in the old base after the completion of the road. It is true the witnesses testified that the damage was caused by putting the asphalt surface on a smooth base, but the contractor knew all about this before and at the time he executed the maintenance bond. He testifies that he talked to the engineer of the district and to some other parties. There is no evidence, however, showing that he ever suggested to the commissioners that the old base should not be smooth, and, so far as the record discloses, they knew nothing about it. But, if they had known about his suggestions, it would not relieve him from liability on the bond. If appellant's contention is true, the maintenance bond is practically meaningless. The construction bond provided for the proper sort of material and the proper construction, and it is agreed by all parties that the construction contract was performed. But the evident intention of requiring a maintenance bond was that the contractor should keep the street in repair for five years unless some defect, not then known, appeared in the old base, and it is not contended by appellant that there is any defect, except he contends that the base being smooth was a defect."


State Highway Contractors' Liability for Injuries to Travelers


A contract or statutory obligation on the part of a state highway contractor to maintain lights, barriers, etc., to avoid injuries to travelers while a road is under construction makes the contractor liable for injuries sustained by travelers as a direct consequence of neglect to comply with such obligation, holds the Alabama Supreme Court in the case of Morgan Hill Paving Co. vs. Fonville, 119 So. 610, disposed of January 24, 1929. The state is not liable in such cases, but this immunity does not extend to the contractor, the court concludes.


How Long Is "Permanent?"

In an interesting case lately decided by the New York Court of Appeals, December 7, 1928, (Arentz vs. Morse Dry Dock & Repair Co., 164 N. E. 342) it appeared that an employee was discharged because of slackness of business. He sued for damages on the ground that this constituted a breach of an existing contract that he was to have "permanent employment." He claimed that such agreement protected him from discharge without cause during his lifetime and so long as the employer remained in business. Overruling this claim, and holding that the suit was properly dismissed, the Court of Appeals said:

"Wherever these words, 'permanent employment,' have been used in contracts which have been between employer and employee, under circumstances as they appear in this case, they have been held to mean a steady employment, a steady job, a position of some permanence, as contrasted with a temporary job or a temporary employment. Standing alone and by themselves, they do not mean life employment. . . . An agreement to give a person permanent employment means nothing more than that the employment is to continue indefinitely and until one or the other of the parties wishes for some good reason to sever the relation."


MIXERS


PAVERS


PNEUMATICS

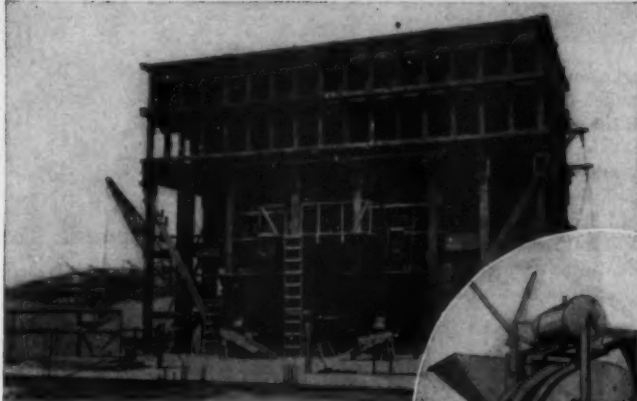
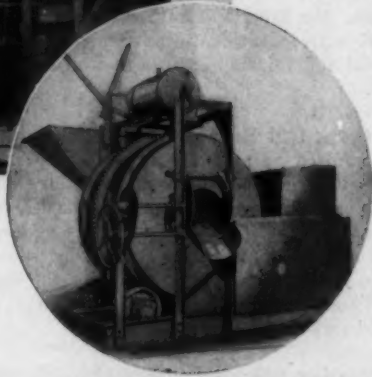
Ransome

28-S

STANDARD

BUILDING MIXER


on the **SAN FRANCISCO**
BAY TOLL BRIDGE

The two Ransome 28-S Mixers

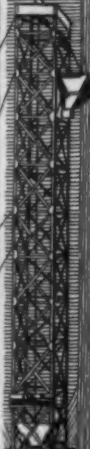
The Raymond Concrete
Pile Company with two
Ransome 28-S Standard
Building Mixers poured 50,755 cubic yards of concrete
from April 3, 1928 to October 1, 1928.
These mixers ran every day without a breakdown.

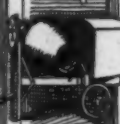
PERFORMANCE !

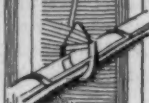

Ransome Concrete Machinery Company
 Dunellen


1927 - Service for 75 Years - 1928
 New Jersey





STEEL TOWERS


TILTING MIXERS


CHUTES


MIXERS


PAVERS

Construction Industry News

The Construction Machinery Co., Waterloo, Iowa, announces the addition of the following distributors to handle the complete line of the company, including Wonder tilting mixers, Marsh-Capron drum type mixers, CMC builders hoists and pumps and Kern variable speed drag scraper units in the state of Texas; R. B. George Machinery Co., Dallas; McMillin Machinery Co., Houston; B. P. Clark Machinery Co., San Antonio; Plains Tractor & Implement Co., Amarillo; West Texas Tractor & Machinery Co., Plainview; and Golay-Kirkpatrick Tractor & Implement Co., Harlingen.

United Tractor & Equipment Corp., Chicago, Ill., has announced two new members in the municipal and construction fields, Maine Steel Products Co., South Portland, Maine, manufacturer of snow plows, and Northwestern Manufacturing Co., Milwaukee, Wis., makers of portable electric arc welding equipment.

J. D. Wallace & Co., 134 South California Ave., Chicago, Ill., manufacturers of portable woodworking machinery, has taken over the John T. Tousley Manufacturing Co., Cincinnati, Ohio, manufacturers of large woodworking machinery and factory trucks.

Continental Motors Corp., Muskegon, Mich., has announced the opening of a branch office of the company in Los Angeles to take care of the business west of the Mississippi River. Ray Long, who has been associated with Continental Motors for several years as Assistant Sales Manager of the Industrial Division, has been appointed Western District Manager and will take over his duties some time this month. Mr. Long will have complete charge of sales, handling the entire Continental line which includes automotive, industrial and aviation engines as well as Continental accessories.

M W Lubricants Corp., 1601 Hennepin Ave., Minneapolis, Minn., has been organized to manufacture and market a high grade heavy duty lubricant or grease, made especially for tractors, trucks and heavy duty machinery. In the reorganization effected early in May, B. F. Hamey continues as President and E. H. Bracht as Sales Representative. Paul C. LaBlanc, formerly Sales Manager of the D-A Lubricant Co., Indianapolis, has joined this company as Vice-President in charge of sales.

The Osgood Co., Marion, Ohio, has purchased all the outstanding capital stock of the Power Manufacturing Co., Marion, Ohio, manufacturers of Primm vertical oil engines, built in sizes ranging up to 360 horsepower.

Williamsport Wire Rope Co., Williamsport, Pa., has announced that N. R. Downie has been appointed District Sales Manager for Western New York with offices and warehouse located at 154 Terrace, Buffalo, N. Y.

Aerol Burner Co., Inc., West New York, N. J., announces that R. S. Arthur, formerly in charge of the Chicago office of the Dravo Equipment Co., has been appointed Manager of the Midwestern branch office recently opened by the Aerol Burner Co., at 175 North Wacker Drive, Chicago, Ill.

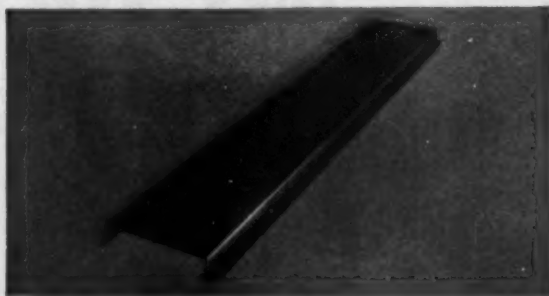
The Speeder Machinery Corp., Cedar Rapids, Iowa, has announced the appointment of H. W. Parsons as Assistant General Sales Manager.

Operating Cost Statistics of Automobiles and Trucks

A RECENT bulletin on the operating cost statistics of automobiles and trucks has recently been compiled by T. R. Agg, Highway Engineer, Iowa Engineering Experiment Station, and Harold S. Carter, Professor of Civil Engineering, South Dakota State College, and is published by the Engineering Experiment Station of Iowa State College. The purpose of this report is to present statistics of automobile and truck operating costs as reported by the owners and operators of the vehicles and from these reports to estimate general average automobile operating costs and the probable variation in cost of three classes of road surfaces, the high, intermediate and low types.

The data is arranged in tabular form, and includes actual reported costs of operating automobiles, a summary of the reported costs, estimated comparative costs, the relative cost of operation in various classes of highways, truck operating costs and a general summary.

Copies of this Bulletin 91 may be secured gratis by writing to the Director, Engineering Experiment Station, Station A, Ames, Iowa.



The New Ferrobord for Roofing

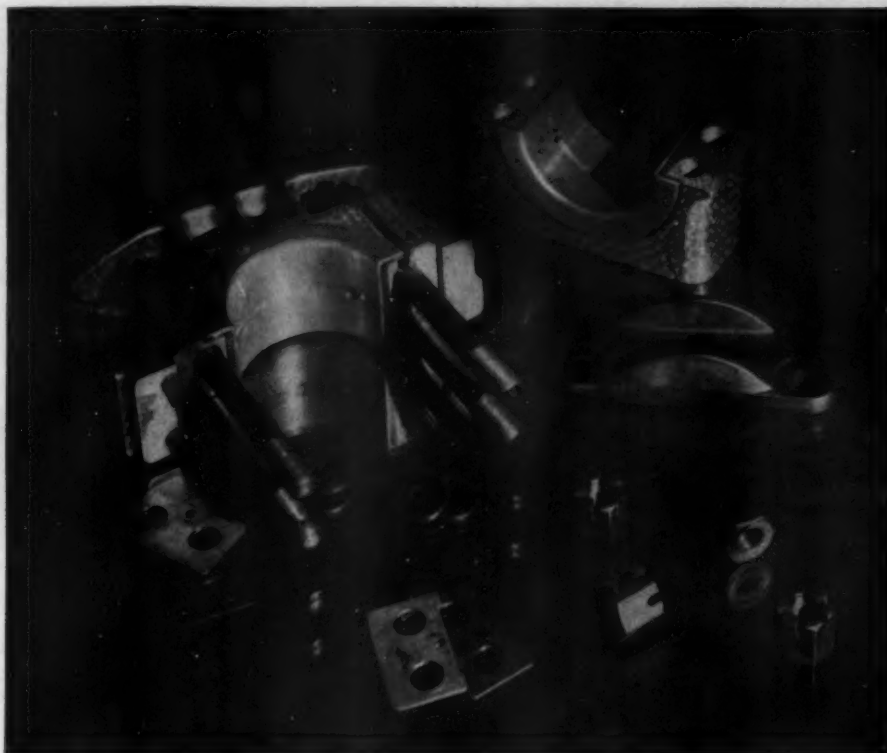
New Steel Roofing

FERROBORD, a new steel roof deck in 6-inch wide units, to be used as the base for any desired amount of insulation and for waterproofing materials, is manufactured by the Truscon Steel Co., Youngstown, Ohio. This new roof material presents a permanent surface of unbroken smoothness for the application of insulation. Each 6-inch strip is rigidly locked to those on each side of it by a patented groove and flange formed on the strips, thus creating a mechanically integral unit which is rigid over the entire roof area.

Another feature of Ferrobord is that the strips are spliced by butt joints which may be made at any point without reference to supporting members. These joints are practically invisible from underneath. This feature makes possible the utilization of short pieces cut off in fitting strips to the roof dimension. The strips may run either way of the roof, depending on which method of application is more economical.

A specially designed cleat is used to anchor the insulation to the steel on steep pitched roofs, rendering slippage or creeping of the insulation impossible.

Ferrobord is a light weight roof deck, being made in 18 and 20 gage copper alloy steel, in depths of 1¼ and 1¾ inches. It comes in strips of any desired length and may be used on any shaped roof.



The **WHY** of reinforced bearing caps



L-HEAD ENGINES
THEY TAKE BETTER
CARE OF THEMSELVES

An engine is no better than its parts. Waukesha Engines are famous for their remarkable stamina, only because the design of each part directly contributes to the extra rigidity of the whole engine structure.

In many models, Waukesha crankshaft bearings are fitted with steel backed bearing caps, held in place by four heat-treated, alloy steel, stud bolts. Extra deep, ribbed and trussed, they afford the shaft a solid support—and at the center, between the bearing studs, the reinforced steel backed cap prevents distortion. Positive shaft alignment is assured. Without this absolute bearing rigidity—wear, vibration and overheating would be excessive—result, a tremendous loss of power. That's the *why* of Waukesha bearing construction.

Write today for descriptive bulletin. *Industrial Equipment Division, Waukesha Motor Company, Waukesha, Wisconsin. Offices: 8 West 40th St., New York; 7 Front St., San Francisco.*

952

▲ ▲ WAUKESHA ENGINES ▲ ▲

A New Hand-Rotated Stoper



The New CP Wet Hand-Rotated Stoper

A NEW wet stopper combining high drilling speed, light weight, short overall length, ease of operation, low upkeep and convenient air control for difficult drilling conditions is manufactured by the Chicago Pneumatic Tool Co., 6 East 44th Street, New York. Tests in various parts of the country have shown this stopper, known as the CP-146W, to have high drilling speed in hard rock, and the sensitive air feed control results in uniform speed in broken, fitchery formations.

The main features of this drill are symmetrical design, light weight, 82 pounds, four-bolt construction giving ready accessibility to all working parts, spring-retained front head, fully-cushioned, one-diameter piston, rugged, tubular valve housed in renewable bushings in the cylinder wall, and piston-controlled exhaust, full 24-foot feed travel, air and water swivel connections conveniently located and automatic lubrication.

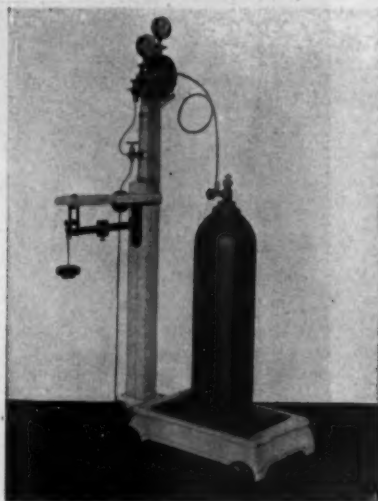
These CP-146W stoppers are 52 $\frac{3}{4}$ inches long, with feed piston closed, and 76 $\frac{3}{4}$ inches long with piston extended. The diameter of the piston is 2 $\frac{3}{4}$ inches, the length of the stroke 3 $\frac{1}{2}$ inches, the size of the air hose 1 inch and the size of the water hose $\frac{1}{2}$ -inch.

A dry stopper, similar to the wet one and known as CP-146, is available for work where this type of drill is needed.

A New Combination Chlorinator and Scales

IN order to save floor space and to insure the availability of the platform scales at the chlorinator to check the weight of chlorine cylinders at all times, the Paradon Manufacturing Co., Arlington, N. J., has developed a new combination chlorinator-platform scale, known as its Model DBP chlorinating scales.

The complete chlorinator is directly mounted on a standard platform scale. The unit is designed so that all parts of the combined chlorinator-scale are interchangeable with the parts of the regular chlorinator without the scale mounting so that



The New Paradon Combination Scale and Chlorinator

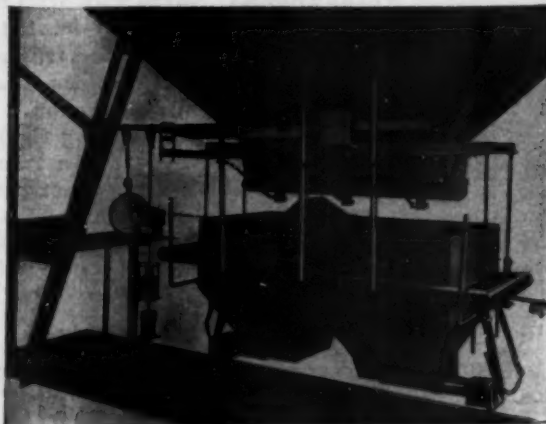
existing chlorinator installations may readily be converted to the new chlorinating scale type.

The use of the platform scale in connection with a chlorinating installation has become standard practice among engineers and sanitarians. The cost of the new chlorinating scales using a standard platform scale is no more than the cost of a chlorinator and scale separate.

A Weighing Hopper With All-Steel Scale

A NEW and improved type of weighing hopper which combines accuracy with ease of operation and is equipped with an all-steel scale has been announced by the Butler Bin Co., Waukesha, Wis. This new hopper is shipped in a complete unit with the scale attached and can be very easily installed on any steel, wood or cement bin by merely bolting the frame from which the hopper is suspended immediately below the openings in the bin.

The hopper is equipped with a dial which indicates over or under weights and three radial gates, two for stone and one for sand, insure accurate control and rapid delivery of the aggregates from the storage bin to the hopper. Counterbalanced automatic discharge gates allow the weighed batch to discharge into the truck or mixer. Either platform or ground operation may be provided and also a separate beam and poise for each material to be weighed.



The New Butler Weighing Hopper with the All-Steel Scale

1 analysis

Points to consider in selecting
culverts and drains No. 3*

Uniform material assures uniform drainage service

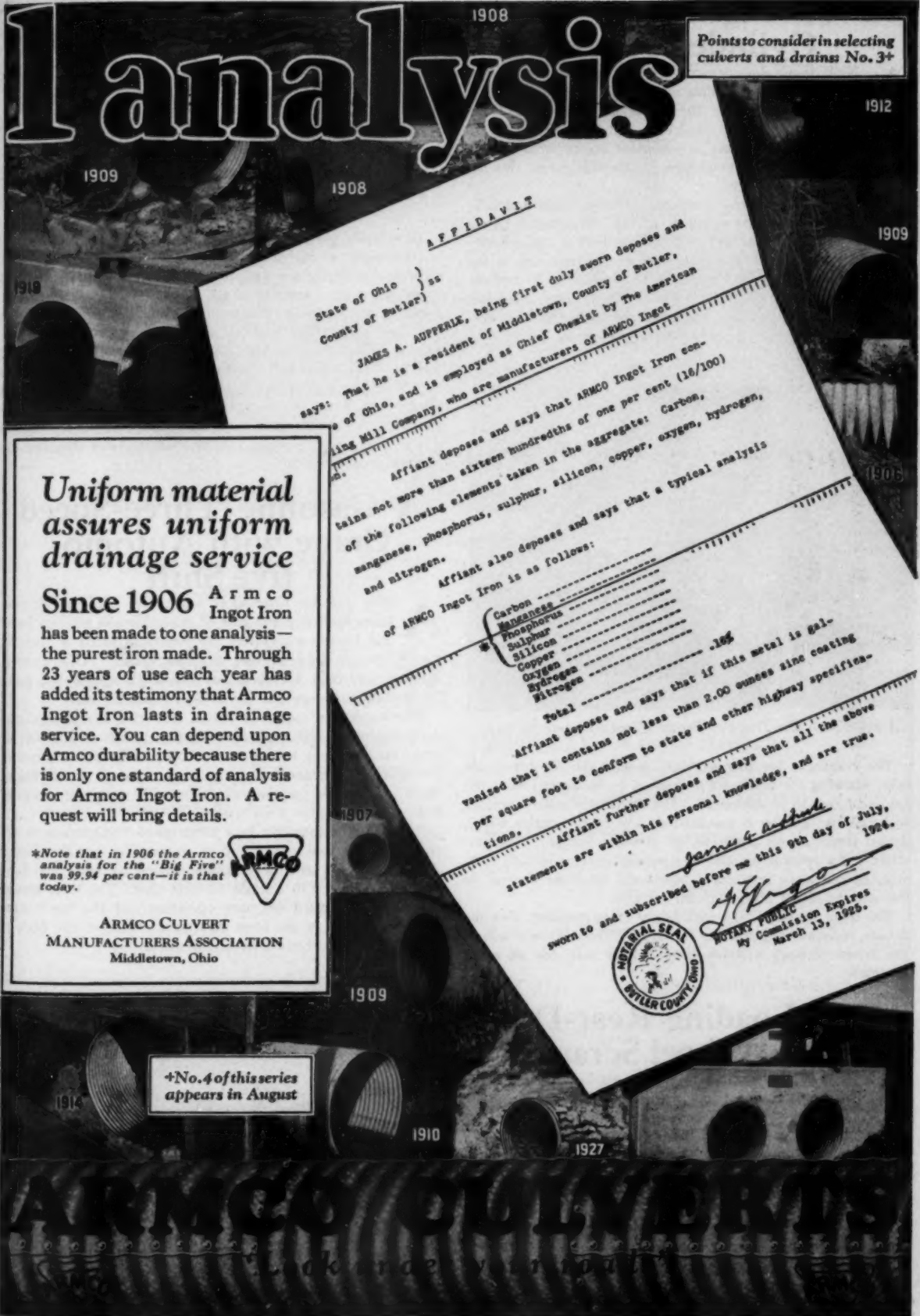
Since 1906 Armco Ingot Iron has been made to one analysis—the purest iron made. Through 23 years of use each year has added its testimony that Armco Ingot Iron lasts in drainage service. You can depend upon Armco durability because there is only one standard of analysis for Armco Ingot Iron. A request will bring details.

*Note that in 1906 the Armco analysis for the "Big Five" was 99.94 per cent—it is that today.



ARMCO CULVERT
MANUFACTURERS ASSOCIATION
Middletown, Ohio

*No. 4 of this series
appears in August



AFFIDAVIT

State of Ohio)
County of Butler) ss

JAMES A. AUFFERLE, being first duly sworn deposes and says: That he is a resident of Middletown, County of Butler, Ohio, and is employed as Chief Chemist by The American Mill Company, who are manufacturers of ARMCO Ingot Iron.

Affiant deposes and says that ARMCO Ingot Iron contains not more than sixteen hundredths of one per cent (16/100) of the following elements taken in the aggregate: Carbon, manganese, phosphorus, sulphur, silicon, copper, oxygen, hydrogen, and nitrogen.

Affiant also deposes and says that a typical analysis of ARMCO Ingot Iron is as follows:

Carbon	.....
Manganese	.....
Phosphorus	.....
Sulphur	.....
Silicon	.....
Copper	.....
Oxygen	.....
Hydrogen	.....
Nitrogen	.....
Total	..... .16%

Affiant deposes and says that if this metal is galvanized that it contains not less than 2.00 ounces zinc coating per square foot to conform to state and other highway specifications.

Affiant further deposes and says that all the above statements are within his personal knowledge, and are true.

sworn to and subscribed before me this 9th day of July, 1928.



NOTARY PUBLIC
My Commission Expires
March 13, 1929.

New Light Duty Six-Cylinder Truck

A NEW light duty six-cylinder truck, having an allowable gross weight rating of 8,000 to 10,500 pounds, has been announced by the White Co., Cleveland, Ohio. The new chassis, known as Model 61, will be available in 148 and 170 wheelbases. It has a 6-cylinder engine with a large diameter, seven-bearing crankshaft delivering power through a four speed transmission.

Easy steering and control combined with four wheel hydraulic brakes make for ease and safety in driving. The engine, clutch and transmission are in unit. The crank-shaft is dynamically and statically balanced. All valves are on the right side of the L-head engine, with removable cylinder head and all combustion chambers fully machined. Double Invar strut aluminum alloy pistons are used and a compound jet carburetor and hot-spot manifold give good carburetion at all speeds.



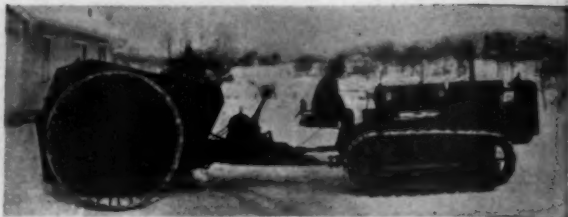
A 2 1/2-Ton White Truck in Ready-Mixed Concrete Service

The crankcase breather exhausts around the carburetor intake, allowing the combustible content to be burned with the gas and fumes to be exhausted. The distributor which operates with battery ignition is mounted on top of the engine block, driven from the oil pump of the pressure system. Thermostatic water control, air and oil cleaning systems, a core radiator, an attractive instrument board and headlight control on the steering wheel are additional features.

The large frame section with heavy cross members give the chassis adequate capacity for its rating. The dual rear wheels are driven through a sturdy semi-floating rear axle on roller bearings.

A Self-Loading Rear-Dump Two-Wheel Scraper

A TWO-WHEEL scraper which is self-loading, rear-dump and operated by one man is manufactured by the Highway Trailer Co., Edgerton, Wis. This scraper, which ranges in size from 2 cubic yards to 5 1/2 cubic yards capacity, is a compact unit of scraper and trailer which can be turned around in a 24-foot circle. The scraper pan is carried on an axle in a channel steel frame, supported by two wheels and hooked to the tractor by a drawbar and pin. Power is taken from the rear of the tractor and transmitted to the transmission of the scraper by means of a compound universal joint and drive shaft. By use of two levers, the power is distributed to the rakers by sprockets and chains, and for raising and lowering the pan by means of steel cables winding in sheaves.



The New One-Man Highway Trailer Company Scraper-Trailer Unit

All wearing parts are of manganese steel. The cutting bit of plow steel is reversible and can be quickly changed. The transmission shafts are equipped with Alemite fittings and all transmission gears operate in oil.

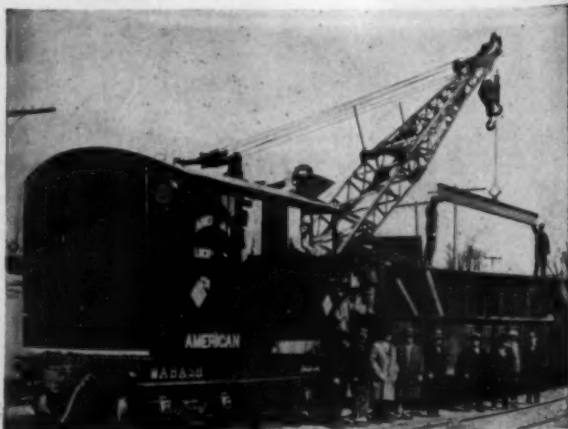
One man is able to handle the whole job, and can pick up and load an average load of material in approximately one minute. When ready to load, the pan is lowered to the desired depth and the rakers pull the dirt back from the bit, rising with it. When the pan is full it is upended, wheeled any desired distance and a pull of the rope releases the latch of the dumping door. All of this takes place without the driver leaving his seat and round after round can be made without stopping the progress of the tractor.

A Gasoline Three-Speed Crane with Automotive Shift

A NEW gasoline three-speed locomotive crane which features flexibility and ease of operation has recently been put on the market by the American Hoist & Derrick Co., 63 South Robert Street, St. Paul, Minn. This crane is designed and built for operation with a gas engine and gains its flexibility through the use of an automotive shift.

The 4-cylinder motor is bolted into the heavy revolving deck casting to eliminate the vibration which is unavoidable when the engine is resting on brackets. Directly in front of the engine and connected to the power take-off of the engine there is a flexible coupling which connects with the transmission case.

The heavy automotive type three-speed transmission is operated with a foot clutch and an automotive gearshift lever. All transmission and bevel gears connecting with the drive shaft are enclosed in a single oil-tight case. The lever system has been redesigned for easy operation and the lever stand moved right up to the front righthand corner of the deck to give the operator clear view of the work.



The New Lorain Gasoline Powered Crane



NEWBURYPORT TURNPIKE

Massachusetts State Highway, Boston to Newburyport. Asphalt Macadam construction with SOCONY Asphalt Binder in 1923. This view was taken in October, 1928, after carrying heavy traffic for five years without repairs or resurfacing.

Standard Asphalt Products

Standard Asphalt Binder A
for surface treatment

Standard Asphalt Binder B
for penetration work

Standard Asphalt Binder C
for the mixing method

Standard Asphalt Joint Fillers
for brick or block pavements

Standard Cold Patch Asphalt
*for repairing all types
of bituminous road surfaces*

Standard Refined Asphalt
(Socony Brand)
for sheet asphalt paving

Standard Paving Flux,
Bridge Asphalt and
Preserving Oils

*Specifications and all other particulars
furnished on request*



STANDARD OIL COMPANY OF NEW YORK, 26 BROADWAY

The revolving mechanism consists of the American enclosed roller path with 20 bronze-bushed conical steel rollers. The weight of the machinery deck boom and load is carried directly by these rollers. The revolving deck is fastened to the car body by two interlocking rings at the outer circumference of the bull gear, insuring uniform stability. The machinery deck is a solid casting of semi-steel to which all operating parts are securely bolted.

The car body is fabricated of structural steel, with 15-inch steel girder side sills. These girders weigh 141 pounds per foot. The car body is mounted on two four-wheel swiveling trucks. In the center of the structural steel body there is a heavy semi-steel casting which serves as a solid base for the lower roller path, bull gear and superstructure. These cranes can be supplied in any capacity from 12 tons to 30.

All-Steel Heavy Duty Tool Boxes

ALL steel heavy duty trailer tool boxes which are designed for highway maintenance departments, sewer, paving and bridge contractors and public utility companies are manufactured by Littleford Brothers, 457 East Pearl Street, Cincinnati, Ohio. Jack hammers, drills, squeegies, smoothers, hoes, rakes, shovels, picks and all other equip-



The New Littleford Trailer Tool Box

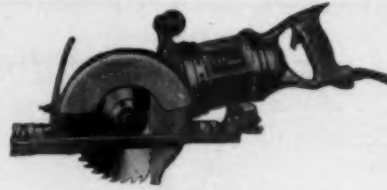
ment used in construction and maintenance work may be stored in these boxes.

The box is 8 feet long, 45 inches wide and 24 to 29 inches deep. It is made of 12 gage steel, with a heavily reinforced bottom. The box is large and roomy, and arranged so that tools may be kept in order and easily found when wanted. A strong 12 x 2-inch shelf extends the full length of the box, 19 inches from the bottom. Wrenches, hammers, saws and smaller equipment may be stored on this shelf, leaving the bottom for the heavier tools and insuring safety for these smaller pieces of equipment when the outfit is trailed over rough roads.

The double cover is water-proof, flanged on all edges and is rigid and strongly hinged. When thrown open it is held in place by a lock device which will not let the cover fall down until released. Just in front of the tool box is a steel work bench 48 by 24 inches. It is built between the 5-inch channels that form the chassis and is strong enough to hold a vice or other bench tools. The box is also provided with a lock on the side wall and offers complete protection from theft.

The chassis on which this tool box is mounted is made of 5-inch channels strongly braced by 5-inch cross headers and joined at the front end by an unbreakable cast steel pulling eye. It is mounted on 10-leaf 44-inch semi-elliptical springs which absorb shocks and permit rapid trailing. The 32 x 5-inch rubber-tired wheels are equipped with Timken roller bearings and all shackle bolts have Alemite fittings.

The overall chassis from back to pulling eye is 12 feet 3 inches and the over-all width from hub to hub, 75 inches. Strong drop legs are placed at back and front, both of which are non-collapsible and hold the box firmly in place. The rear drop leg is raised and lowered by means of a lock device and the front drop leg can be released, swung forward and fastened under the chassis.



The Black & Decker Portable Hand Saw

A New Portable Electric Hand Saw

A NEW electric hand saw, with the circular saw made in three sizes, 6, 8 and 10 inches in diameter, has recently been announced by the Black & Decker Manufacturing Co., Towson, Md. These saws will cross cut and rip lumber up to 3½ inches thick and in addition can be used with a special metal cutting saw for cutting light gage metal, or with an abrasive disc for cutting slate, marble, tile or porcelain. The saw blades are enclosed in telescopic guards so that as the saw progresses in the work the guard automatically telescopes and when the cut is finished the guard snaps all the way back, entirely covering the saw blade.

The saw is arranged with an adjustable shoe which can be set to cut at any depth, up to the capacity of the saw, for cutting rabbets. The shoe, which is notched to make it easy to follow a pencil line on the work, is adjustable also for cutting any angle up to 45 degrees for mitering or for the jointing of long edges.

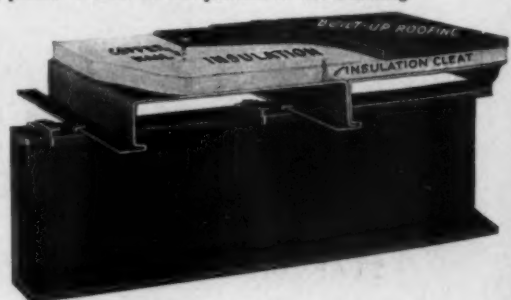
These saws are provided with Universal motors which will operate on direct or alternating current and shipped in a substantial carrying case as a convenience for men who take them out on the job. They are light in weight and the pistol grip and trigger switch affords ease in handling and controlling them. They are full ball-bearing with chrome nickel gears and shafts throughout. They are air-cooled and operate continuously without overheating. The gears run in grease in grease-tight compartments.

The standard equipment consists of one rip and one cross cut saw, one adjustable saw fence, a three-conductor cable with attachment plug and the carrying case.

A New Steel Deck Roofing

A NEW steel deck roofing known as Rigideck has been announced by the Genfire Steel Co., Youngstown, Ohio. It is made in 6-inch widths of Armco Ingot Iron, each of which locks rigidly to those adjacent to it. It presents a smooth unbroken surface to receive insulating materials and can be erected without perforations of the metal.

Each rib is an I-section and each section is formed by the pressing of a patented self-locking rib section into a strip of Armco iron, giving rigidity to the section and providing bearing points to rest on the purlins of the building.

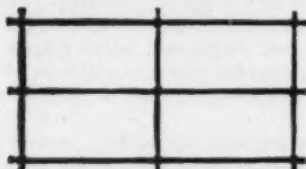


The New Genfire Rigideck

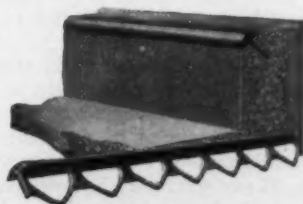
The Complete Line of TRUSCON STEEL PRODUCTS For Roads and Pavements Delivered in One Car



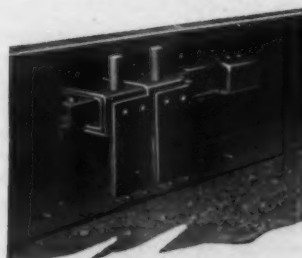
Rib Bars for reinforcing concrete. The bars with a positive grip



Truscon Welded Steel Fabric in flat sheets or rolls. Accurate reinforcement for roads



Truscon Curb Bars for reinforcing concrete curbs and protecting them from abrasion



Truscon Steel Road Forms for accurate and rapid construction of concrete roads



Truscon Contraction Joints provide a definite plane for expansion and contraction

No hold-up on the job when you order Truscon Products! Everything you want for reinforcing the concrete road is there when you need it—the Reinforcing Steel, the Joints and the Road Forms. Contractors tell us that the delivery of all products in one car speeds up the construction while actually saving expense in freight and handling. Specify and buy Truscon Products for your concrete highway. Suggestions and quotations will be given on request.

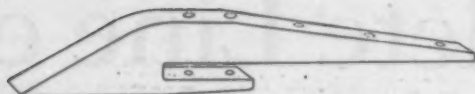
Write for new edition Handbook of Modern Road Construction, full of useful information.

TRUSCON STEEL COMPANY, YOUNGSTOWN, OHIO
HIGHWAY DIVISION

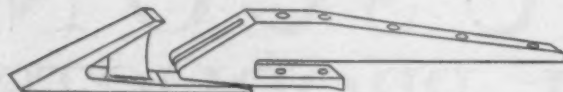
Trussed Concrete Steel Company of Canada, Limited, Walkerville, Ont.
Offices in Principal Cities of the United States and the Dominion of Canada

TRUSCON

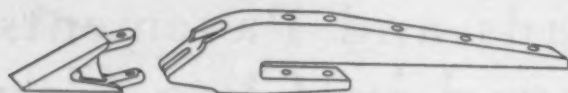
PRODUCTS FOR
REINFORCING
ROADS AND PAVEMENTS



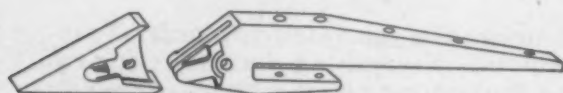
One-piece Solid Dipper Tooth



Panama Non-reversible Two Part Tooth



Panama Reversible Two Part Tooth



AMSCO Clark Reversible Dipper Tooth



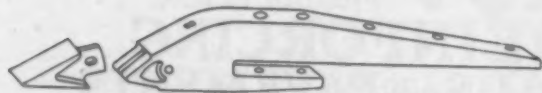
AMSCO Vanderhoef Dipper Tooth



AMSCO Van-Clark Reversible Dipper Tooth



AMSCO Mullally Reversible Dipper Tooth



AMSCO Economy Reversible Dipper Tooth

The Evolution of Dipper Teeth

IN the early days of steam shovel operation digging was found difficult unless fingers or extensions of some sort were placed on the dipper front to penetrate the material and allow the bucket to fill rapidly. At first, pieces of wrought iron were fastened to the digging edge. Then, as more powerful engines were adopted, there appeared the original one-piece solid dipper tooth which was succeeded by the Panama non-reversible two-part tooth and then the Panama reversible two-part tooth. The next improvement was the Amsco Clark reversible dipper tooth, made by the American Manganese Steel Co., Chicago, Ill. Following this, came the Amsco Vanderhoef dipper tooth and the improved Amsco Van-Clark reversible dipper tooth and the Amsco Mullally reversible dipper tooth, which have been supplemented by the Amsco Economy reversible dipper tooth. All of these teeth are illustrated below to give an idea of the changes and improvements which have

been made in this important accessory to the powerful steam gasoline engine and diesel engine driven excavators of today.

Little attempt has been made until recently to associate economy in the use of dipper teeth with the yardage handled by the shovel within a specified time, but it is just as important under the present extreme competition for the contractor to get the most for his money in dippers and dipper teeth as in any other piece of equipment or accessory.

Operators have always realized how much easier shovel operation is and how much more material can be handled when the dipper teeth are sharp, but more often than not, they have delayed changing even with renewable points because of the trouble and expense involved in the changing operation and in sharpening the teeth. It costs money to forge a point and it is expensive to discard the ordinary point when dulled, so output has often been sacrificed to an unwarranted use of blunted dipper teeth. These attempts to get dull points to work effectively, have cost many operators dollars in output where pennies have been saved in dipper tooth points.

After an ordinary large point has been reversed several times and has lost some of its edge, the shovel working in unblasted material sometimes takes three passes of the dipper to pick up the load where one pass would fill with sharp teeth. More fuel and power are used to do 75 or 50 per cent of the work.

A New Series of Gasoline Locomotives

A NEW 1200 series of gasoline powered, gear-driven, industrial locomotives has been announced by the Locomotive Division of the Cincinnati Car Corp., Cincinnati, Ohio. These new locomotives have a number of new and improved features to increase the ease of operation and insure continuous service.

The locomotives have four starting and traveling speeds, both forward and reverse, so that with the amount of engine power provided, through variation in the throttle, considerable flexibility in speed and performance is possible. A large ratio of engine horsepower per ton of locomotive is provided in the heavy, rugged, slow-speed engine used in the different models so that a very liberal draw-bar pull is available in all the different speeds, and at speeds which permit of loads being hauled at a good rate.

The engine is provided with oil purifier, gasoline strainer, temperature gage, the latter being mounted on an instrument panel in the cab with a gasoline gage, oil gage, ammeter and the different switches for control of ignition, lights and starting equipment. A spray-pump primer is also provided to assist in starting in cold weather. A very large water capacity is provided in an oversize radiator in the engine to afford the proper cooling of the engine in hot weather or when in use in hot climates.

The clutch connecting the engine and transmission is so constructed that it can be slipped severely, as is often necessary in starting loads, without any appreciable heating. It is also fully enclosed and running in oil. When adjustment is necessary, this can be made without disturbing either the engine or transmission in any way. In the four-speed transmission provided, the speed changes are easily and quickly made through shifting clutches. A power take-off is also provided for auxiliary use, such as a winch or hoist.

The locomotive has a heavy one-piece steel frame with large reinforcing ribs and struts. An electrically-welded channel steel sub-frame carries the complete power plant, transmission and all operating parts as a unit assembly which is rubber insulated from the main frame to cushion it against shocks and jars in service. The drive wheels are located inside the main frame so that the axle bearings are on the ends of the axle, instead of behind the wheels, to afford convenience in lubrication and inspection of the bearings.

The Restless Age



CAN we afford to build highways wide enough and safe enough to accommodate properly the nation's scurrying, swarming fleet of twenty-five million cars that crowd our highways this restless age? Thousands of miles of Tarvia roads—smooth, skid-safe and durable, yet economical to build and maintain—answer: "We can."

With Tarvia "Re-Tread" new roads can be built and old roads rejuvenated and widened—easily, economically, and with a minimum of inconvenience to the traveling public. No special equipment is necessary and construction and maintenance costs are impressively low. Results are uniformly satisfactory highways of remarkably smooth-riding quality.

The Tarvia field man will gladly give you details. Write, wire or 'phone our nearest office.

The *Barrett* Company

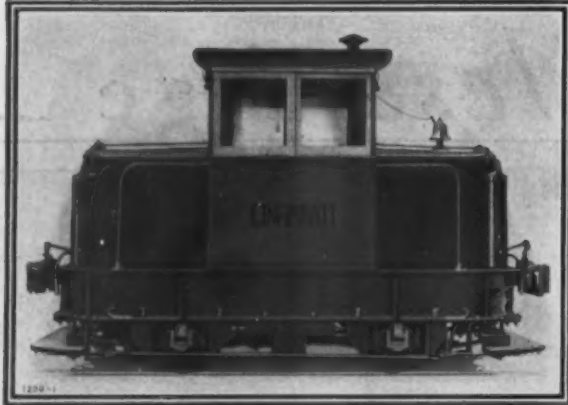
New York	Chicago	Philadelphia
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Tarvia "RE-TREAD"

TRADE MARK REG. U. S. PAT. OFF.



One of the New 1,200 Series of Gasoline-Driven Cincinnati Locomotives

The amidship type of cab used affords complete visibility in every direction and also permits of direct hook-up or connection of the operating levers and controls instead of through a series of rods and bell cranks. The operator handles all levers and controls with his right hand and the clutch with his left foot, thus making all movements easy and natural. Hand brakes are provided either with or without air brakes. Air brakes are optional on all models, but can be furnished for operating on the locomotive alone, or the locomotive and cars together on models as small as the 8-ton.

The different models in this series are all built in a variety of sizes and track gages and are adapted for handling either industrial cars or railroad cars or for any service where track haulage may be employed.

A Non-Clogging Portable Pump

A SMALL portable pump of the open type which will handle 25 to 28 per cent solid matter without clogging has recently been put on the market by the Jaeger Machine Co., 701 Dublin Avenue, Columbus, Ohio. This pump, which is known as the Speed Boy, can handle 8,000 gallons per hour. It is equipped with the Jaeger open type brass impeller which will not rust or stick. It has a simple primer and a real foot valve. It is easy to start by means of a foot starter.

The Speed Boy is powered by a Briggs & Stratton air-cooled engine with 2-horsepower and 4-cycle construction which will stand up under constant heavy pumping. The construction of this pump is strong and sturdy and at the same time it is very compact and easily moved about by one man.



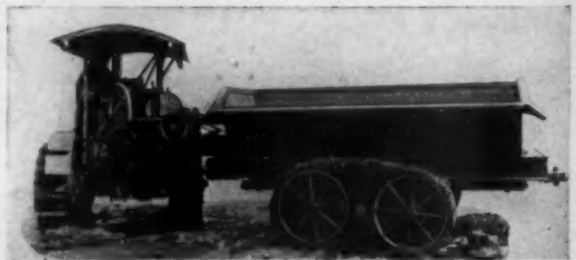
The Jaeger Portable Speed-Boy Centrifugal Pump

A New Cart-Type Full Bottom Dump Wagon

A NEW Road-Layer bottom dump wagon, equipped with tractor-type tracks, is manufactured by the LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa. This wagon, designed for use with a tractor, is operated entirely by one man. A simple oil pump operated by the power take-off of the tractor and a heavy duty large capacity low pressure oil jack on the wagon enables the tractor driver to raise the doors at will from his seat on the tractor. A ratchet gear and trip dog hold the doors in position. A cable runs from the wagon to the driver's seat so that he may dump the load in any desired place. The cart-type construction enables the wagon and tractor to turn in a 26-foot cut or to turn in even smaller radius on a fill.

The water-level capacity of the Model J-15 equipped with elevating grader flare-boards is 6.2 yards. The heaped capacity is 7½ yards. The same wagon equipped with the steam shovel flare-boards is designated as Model J-16 which has a water-level capacity of 7.3 yards and a heaped capacity of 8.5 yards.

These wagons are easily hauled. The tracks on the wagon follow in the path of the tractor tracks. Absence of wheels in front and ample track-bearing surface prevents miring, and reduces the draw-bar pull required. They are equipped with a special tractor drawbar attachment which bolts to the trac-



The New La Plant-Choate Model J-15 Road Layer Wagon

tor and furnishes an extra strong drawbar to withstand jerks and to enable it to stand the upward and downward pressure of over balanced loads. The wagon pull bar is equipped with a spring to absorb the jerk of starting.

The Road-Layer tracks, which are manufactured under license of the Caterpillar Tractor Co., have hardened and heat-treated steel axles and numerous other features. This track gives a large bearing surface and the track rail acts as an incline that gradually raises the load over obstructions. This curvature on the track acts as a pivot point in turning, and makes turning easy.

The simplicity of the one-spot grease system which distributes grease to the bearings and wearing parts of the wheel and prevents the escape of grease minimizes the chance of damage through lack of grease.

These wagons are full bottom dump, the doors being hinged on the inside of the wagon with a large chain link which allows the doors to swing in or out, up or down, thus giving a freedom to prevent damage to the doors in turning or in passing over obstructions. The opening is extra wide, allowing 48 inches for the passage of dumped material. The large clearances of the arches, center axle and rear frame of the wagon allow an extra large escapement opening at the rear. This eliminates that heavy pull required in the case of small openings. The doors are rigidly reinforced at all points.

A drawbar coupler casting with swivel toggle is attached to the rear of the wagon where additional wagons may be attached for use in trains or transporting.



SOUND ECONOMY and BETTER CONCRETE ROADS

FOR curing concrete roads the use of Solvay Calcium Chloride effects savings which are profitable to road builders and road users alike.

Solvay Calcium Chloride curing assures the strength which makes better concrete roads. Cured by either the integral or the surface method, these roads require only about half the usual delay before opening to traffic.

Both curing methods eliminate the need for constant sprinkling and inspection and do away with the expense of the final clean-up required by the old cover methods of curing.

Valuable practical information is contained in the booklet, "Curing Concrete Roads with Solvay Calcium Chloride." Write today for your copy.

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Calcium Chloride

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New York



The General 1/2-Yard Shovel



A General Excavator with Crane Boom Handling Clamshell Bucket

A Full-Revolving Convertible Excavator

A FULL-REVOLVING and heavy-duty 1/2-yard excavator which is designed for efficient and dependable service as a shovel, clamshell, dragline, back-hoe, skimmer, crane or backfiller, is manufactured by the General Excavator Co., 200-274 Rose Street, Marion, Ohio. This machine is of extra heavy construction with ample reserve power to meet the demands made upon machines used in these several services.

The foundation for the entire revolving structure of the General is the center member casting, a one-piece steel casting weighing a ton and a quarter. The operating machinery, decks, power plant and house, the stay frame and the four conical swing rollers are all mounted on this casting and the boom hinges in lugs cast at its front end. All upper body operating machinery, fuel tank and similar parts have been positioned back of the center pin. Their weight, while live and forming an active part of the machine, also serves as counterweight, so that the amount of dead weight used only as counterweight is very small. Thus without excessive weight steady stable operation and responsive swinging of the upper body is insured. The conical swing rollers are 14 inches in diameter, of high carbon electric steel. All the upper body gears, of which there are only 9, are of steel with cut teeth.

Standard equipment on every General includes a power-operated worm and gear type boom hoist. It lowers and raises by engine power; no ratchets or brakes are used. The operating mechanism is fully enclosed and runs in oil. The drums and sheaves are all of unusually large diameter and the ropes lead fair and without reverse bends.

When gasoline drive is used the power is furnished by a Buda 4-cylinder, 4 1/2-inch bore, 6-inch stroke gasoline engine. This engine develops full 45 horsepower at a governed operating speed of 1,000 rpm. The operating parts of this Buda engine are sealed against dirt and dust by a gasoline strainer and a large oil-type air cleaner. The fuel tank holds 35 gallons, is mounted back of the engine and feeds by gravity. Or if desired the excavator may be equipped with electric drive, using either alternating or direct current. A motor of 25 rated horsepower is used, corresponding in actual horsepower to that of the gasoline power plant. It occupies the same position and drives through the silent chain in the same way.

The operator sits in the extreme front of the machine, where he commands a full view of the work. His seat is adjustable, and all operating levers, pedals and controls are easily and conveniently reached from this position. The cab is of Press-Form steel, fully enclosable. All joints and reinforcements are made by electric welding and the cab is waterproof. By operating four sliding doors, sliding plates for the front and

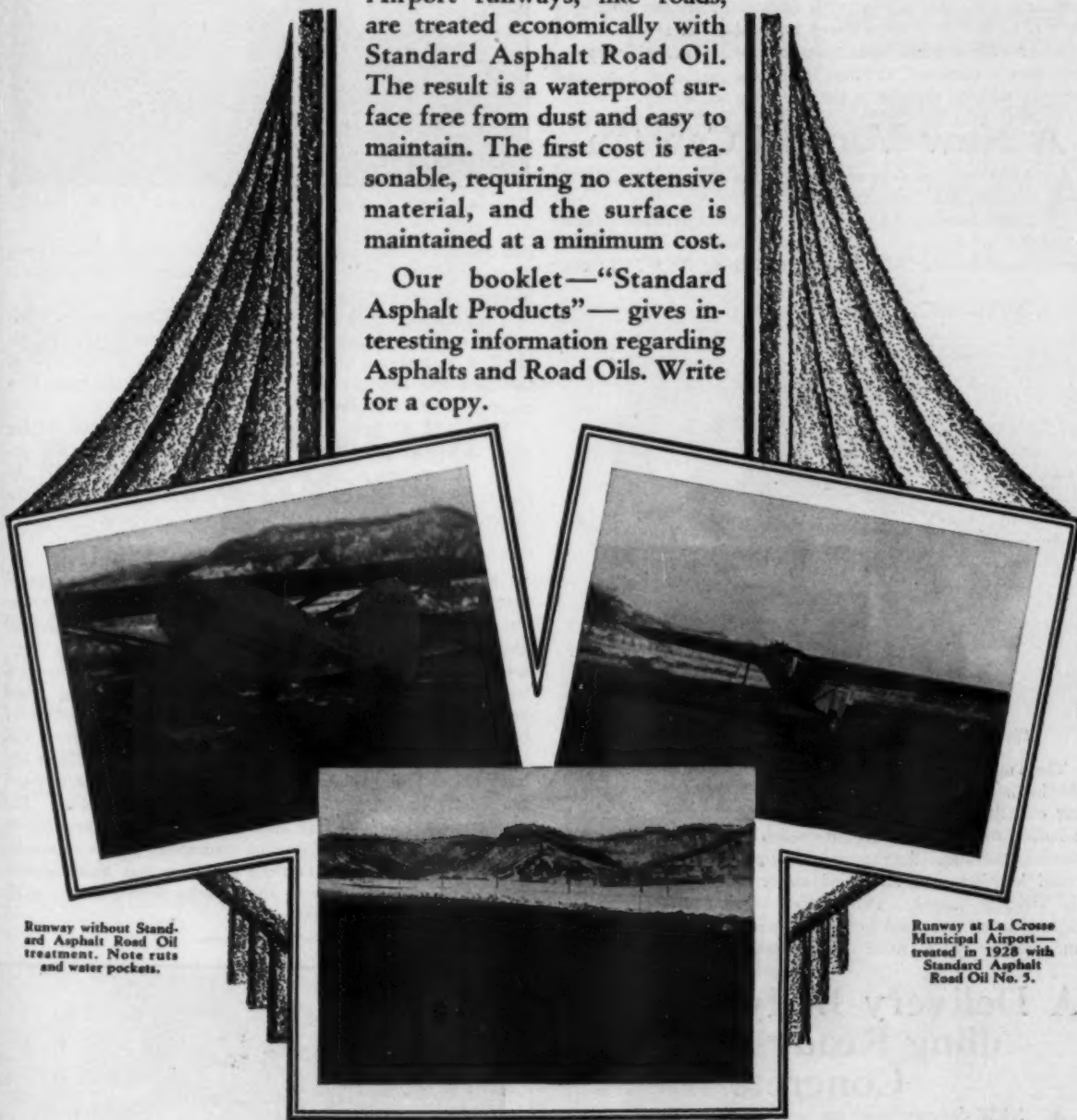


The Complete Line of General Excavator Shovels, Cranes and Draglines

AIRPORT RUNWAYS TREATED WITH STANDARD ASPHALT ROAD OIL

Airport runways, like roads, are treated economically with Standard Asphalt Road Oil. The result is a waterproof surface free from dust and easy to maintain. The first cost is reasonable, requiring no extensive material, and the surface is maintained at a minimum cost.

Our booklet—"Standard Asphalt Products"—gives interesting information regarding Asphalts and Road Oils. Write for a copy.



Runway without Standard Asphalt Road Oil treatment. Note ruts and water pockets.

Runway at La Crosse Municipal Airport—treated in 1928 with Standard Asphalt Road Oil No. 3.

Note smooth surface with complete absence of ruts, holes and water pockets.

STANDARD OIL COMPANY (Indiana)

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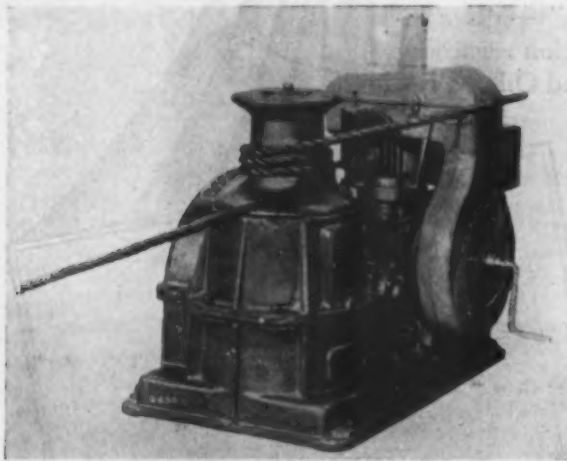
MISSOURI
Kansas City
St. Joseph
St. Louis
Minot

a hinged sliding roof section the cab may be opened to give full ventilation or may be completely closed and locked.

The clamshell and dragline buckets, backfiller board and hookblock are all handled by the General with the standard crane boom, which is of the lattice or box girder type, 35 feet long. For the skimmer and backhoe, the boom is of composite steel and oak construction, with sufficient resiliency to meet the strains and twist encountered in this kind of service. The skimmer and backhoe boom assemblies are interchangeable with shovel, clamshell, dragline, crane and backfiller boom assemblies without changes in the operating machinery.

A New Vertical Capstan

A NEW vertical capstan, known as Tugmore, for moving freight cars and barges on construction jobs, has recently been put on the market by the Lidgerwood Manufacturing Co., Elizabeth, N. J. Compactness has been emphasized in the design, the space required being 25 x 34 inches.



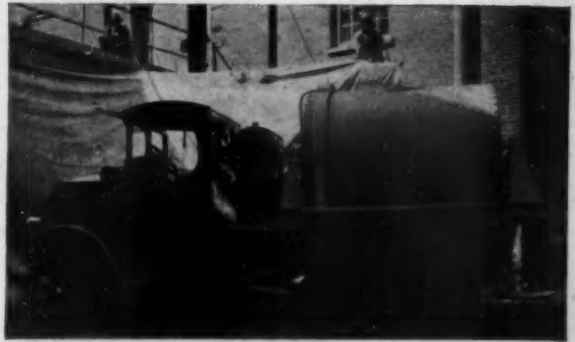
The New Lidgerwood Gasoline Tugmore Capstan

The Tugmore has been made in a standard type and is available in 5 sizes, being powered by a 5 or 7½-horsepower alternating current, a 5 or 7½-horsepower direct current, or a 6 to 8-horsepower twin-cylinder air-cooled motor using gasoline or kerosene for fuel. As capstans are frequently installed in exposed locations, the air-cooled motor was adopted to avoid the freezing hazard. Three types of anti-friction bearings, running in oil, are used in the Tugmore and both the electric and gasoline types are of weather-tight construction.

A Delivery Body for Handling Ready-Mixed Concrete

A NEW delivery body for handling ready-mixed concrete, which has a number of new features, has recently been introduced by the Portland Concrete Machines Co., 53 West Jackson Blvd., Chicago, Ill. The tank, which is designed to be installed on any standard truck chassis of sufficient length and load capacity, is a complete body unit, can be used interchangeably with other bodies and can be mounted on a new chassis or one already in service. It is called the R. M. C. tank and is made in 2, 3, 4 and 5 cubic yard sizes.

Concrete is delivered into the top of the tank and discharged through a door at the rear and bottom. The concrete is hermetically sealed in the tank during delivery, and is completely protected against weather conditions, stiffening or hardening. This is accomplished by rotating the tank at a speed of 3 to 9 rpm through adjustment of a special en-



The New R. M. C. Tank for Delivering Ready-Mixed Concrete

gine governor. This rotation is controlled by a separate power plant attached to the tank at the front and so that rotation is independent of the truck motor.

The interior of the tank is provided with vanes set longitudinally and offset from the shell. These vanes direct and guide the flow of material alternately to the front and rear ends of the tank and together with the rotation, keep the mass in a state of even consistency.

The R. M. C. tank is designed to make the central mixing plant independent of traffic conditions and to insure the delivery of concrete in the exact condition in which it left the mixing plant. It can also be used as a truck mixer, taking the materials from a batcher plant and mixing en route.

This Job Has Real Gold in It

HALF a million dollars or more of free gold is estimated to be in the sand and gravel pits which are to be worked in obtaining materials for the San Gabriel Dam, but, according to the *California Constructor*, very few ounces of the gold will be mixed into the structure. Just who will get the gold is still a matter of controversy. Legal action has been postponed pending a compromise or agreement between the contractors and the San Gabriel Development Co.

Previous to the awarding of the contract for building the dam, placer mining claims had been filed around the site and the county has since filed suits to condemn the claims. The development company has announced that it is prepared to spend \$300,000 in gold recovering equipment. The compromise that has been suggested is along the lines that would permit the mining company to work the deposits before the materials are used by the contractors.



A Cletrac Model 30 Used by the Kenosha Sand and Gravel Company, Silver Lake, Wis., to Pull Two Euclid 1-1¼-yard Scrapers. This Unit Is Used Almost Entirely for Stripping Purposes as Quite a Cut Has to Be Made Before Pay Gravel Is Reached

The Contractor's Choice—



New Improved BROOKVILLE LOCOMOTIVES

(McCormick-Deering—International Power Units)

are saving thousands of dollars yearly for contractors everywhere through providing—

**INCREASED TRACTION
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Guaranteeing the completion of job in advance of schedule with—

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can help you land that next job—or speed up the present one—and we'll be happy to place our experience at your disposal—if you'll let us.

Write today and tell us about your individual problem—our recommendations together with the latest **BROOKVILLE** literature will follow by mail.

BROOKVILLE Locomotives are supplied in standard wide and narrow gauge from 2 to 12 ton models. They are powered by McCormick-Deering—International Power Units—and are adapted to your requirements.

BROOKVILLE LOCOMOTIVE CO.
Brookville, Pa.

BUY DIRECT FROM BOSS MIXERS and HOISTS

**YOU GET SALESMAN'S
& JOBBER'S PROFIT!**

SAVE \$42 to \$384 ON EACH MACHINE

Every manufacturer is trying to reduce his selling costs. We have found the way and are going to give the difference to our customers in order to increase our sales. We have done away with all our salesmen and jobbers and are now selling direct to users. We have deducted the salesman's and jobber's commission from each machine and the difference is our price to you. This is the most astonishing news in the construction industry and it is certainly paying us as sales are jumping by leaps and bounds. Get the new catalogue with new confidential wholesale prices on each machine. It shows the most popular types and combinations, describing each fully—with new price. The coupon will bring it.

SAME HIGH QUALITY

Regardless of this drastic price cut, the quality of BOSS Mixers and Hoists remains the same. They have always been noted for their heavy duty construction and materials. Under no consideration will we ever sacrifice this reputation. Get the catalogue. Note the specifications and compare the prices. You get the same painted Ho-Mixing Action and other exclusive features that have made BOSS preferred wherever used. Hundreds of BOSS machines have ten, twelve and fifteen years of continuous service behind them and still going strong. For quality of design, materials and construction we defy anyone to find a better built machine than a BOSS. You can now get all this for less.



Get Our Prices

Send Coupon for New Catalogue

With Confidential Wholesale Prices

The new BOSS Catalogue gives complete

information on all the BOSS Mixers,

Pavers and Hoists along with the new

confidential wholesale prices. Even if

you do not want to order now, get this

new catalogue and keep it on hand for

future use. Fill in the coupon and mail

today. It will save you money.

Though you may have bought direct from

a manufacturer before you have never

been able to buy at these prices because

no salesman's or jobber's commission is

figured in. Prices on every machine are

greatly reduced. Get the new catalogue

with wholesale prices.

A COMPLETE LINE

We make over 75 various sizes, combinations and types

of BOSS Mixers, Hoists and Pavers. There is a type

for every conceivable use. Get the new catalogue first,

then decide. Often our customers find that they can

use a much lower priced machine after studying this

catalogue. There is no need of going elsewhere for a

certain machine when it is in the BOSS line. Write for

catalogue and confidential wholesale prices; also give

us information on kind of work you want the machine

for. We can probably be of help to you.

1 YEAR GUARANTEE

GUARANTEE—All BOSS equipment is guaranteed

for one year against defective materials and inferior

workmanship. Any parts proving defective will be re-

placed free of charge (electrical or engine equipment

excepted, as this equipment is guaranteed by the

respective engine manufacturers) upon

return to us of defective parts, carrier

charges prepaid for our inspection.

American Cement Mach. Co., Inc.

5 DAYS' FREE TRIAL

So confident are we

that every BOSS Mixer

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complete satisfaction,

that we offer you five

days' free trial. Order

a BOSS. Use it in the

field. If within five

days you do not find it

exactly as represented

in every way, send for

return instructions and

refund of purchase

price. This protects

you; you can't go

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long as we have sold on

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never had a customer

demand his money.

This proves BOSS

quality. Every BOSS

machine is backed up

with an iron clad

guarantee. Read

it above.

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CATALOG—
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PRICES
TELLS ALL**



THE BOSS 3 1/2 TON
MIXER. One half ton
draw type trailer mixer
with 2 disc wheels,
cushion rubber tires,
hatch opener, 2 HP
Stover engine, mag-
neto, steel engine
housing.

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GET OUR PRICES

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AMERICAN CEMENT MACHINE CO.,

238 S. Fourth St., Keokuk, Iowa.

Send me your new catalogue showing complete line of

BOSS Mixers, Pavers and Hoists with confidential

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Town _____ State _____



The Portable Chlorinator Case Opened

A Portable Chlorinator and Testing Outfit for Construction Camps

CHLORINATING equipment for sterilizing water for domestic uses neatly packed in two readily portable cases, one of which contains the chlorinator and the other testing equipment and hose, flexible tubing and all fittings and accessories needed to chlorinate by either the direct or the solution method, has been developed by Wallace & Tierman Co., Inc., Newark, N. J.

The protection of the water supply of a construction camp against pollution is very important. Contamination by fecal matter from a typhoid carrier may result in the complete demoralization of a contractor's organization.

The portable outfit outlined above was primarily designed for sterilizing new water mains. Its portable character and the inclusion of all necessary equipment to put the machine into service and to make the tests for free chlorine in the sterilized water makes this an ideal outfit for use on any construction projects where city water is not available.



The Portable Case Containing All the Chlorinator Accessories and Testing Equipment

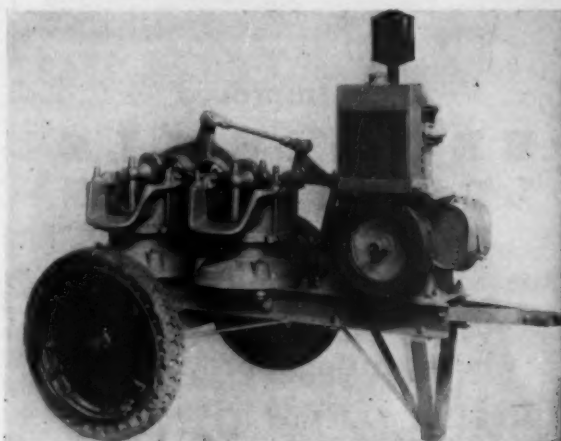
A New Double Diaphragm Pumping Unit

A NEW double diaphragm pumping unit, equipped with a 3-inch pump and powered by a 2½- to 3-horsepower Lauson vertical radiator cooled engine is manufactured by the John Lauson Manufacturing Co., 11 Jackson Street, New Holstein, Wis. The engine in this unit has a number of special features. Among them is a mechanically

driven flyball governor, mounted without the use of complicated parts and fully enclosed in a dust proof housing. It is a quick acting, sensitive governor which maintains a constant speed which can be quickly changed by moving a speed lever.

The crankshaft is mounted in heavy duty roller bearings which are lubricated from the engine crankcase. The crankshaft is 1¾ inches in diameter, balanced with counterweights, which reduce vibration. The camshaft is one piece, drop-forged, hardened and ground, and is mounted in large bronze bearings. The connecting rod is interchangeable with Ford Model T rods.

The lower base of the engine forms an oil reservoir from which the oil can be raised by a submerged plunger driven by an eccentric on the camshaft. The oil is distributed to all vital parts of the engine by the splash system. A high tension Wico magneto, specially designed for high speed motors, is driven by helical cut gear from the camshaft and operates at the camshaft speed. The spark plug is mounted in the head, directly in the combustion chamber. Ample cooling capacity is assured by a roomy water jacket and an especially constructed



The New Lauson Double-Diaphragm Pumping Unit

fan in the engine flywheel. The valves are completely covered by a cap which keeps dirt out of the rocker arms and other working parts. This cap can be removed readily by loosening the hand screw which passes through its center.

This engine has a speed range of from 900 to 1,800 r.p.m. with surplus power at all speeds. It can be speeded up to the maximum capacity of the diaphragm pumps, giving the unit a capacity of 7,000 to 9,000 gallons per hour.

The construction of these units is neat, compact and light in weight, the total weight being only 775 pounds. These units can be furnished with any of the leading makes of diaphragm pumps, mounted on 2-wheel cushion tire trailers or 4 steel wheel trucks.

New Gasoline Powered Locomotive Cranes

FIFTEEN and 20-ton gasoline-powered locomotive cranes have been added to the present line of crawler-mounted crane equipment of the Thew Shovel Co., Lorain, Ohio. These new Lorain cranes are designed and built especially for gasoline power although they may be equipped with either electric or diesel power plants if desired.

These cranes can hoist, swing and travel, two speeds in either direction, or derrick the boom simultaneously with independent control over each operation. The ability to perform these simultaneous operations is due to the Thew center drive superstructure which transmits the full power of the motor directly to the three power shafts, with clutch arrange-

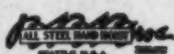
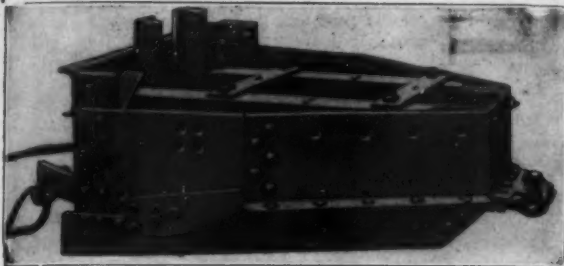
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throughout—with the weight not simply
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it adds Strength and Durability as well as
Digging Power.

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describing the new line of
WILLIAMS Champion Buckets

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FAST-DIGGING BUCKETS

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Designed to come within the weight
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rock drill type of hammer, and at the
same time do more work with less air
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Weighs 97 pounds, delivers over 250
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The New Lorain Gasoline Powered Locomotive Crane

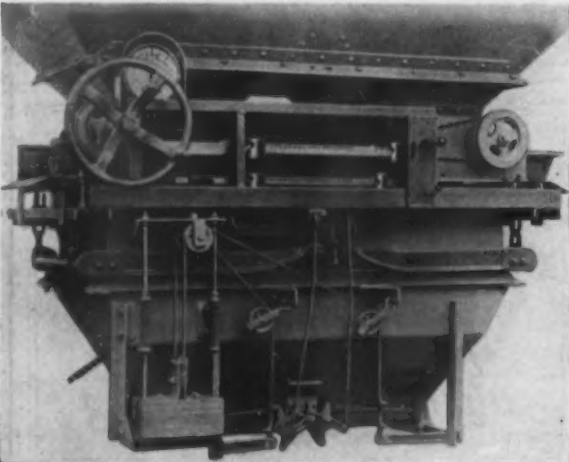
ments to permit engaging them separately or all at the same time. Booster bands on the hoist and swing shafts utilize the engine power to engage the clutches and make for easier, faster operation and control.

They are equipped with 45 or 50-foot booms for use with 1 and 1½-yard clamshell buckets. The booms are in two sections with interchangeable boom heads and middle sections for various boom lengths. The 8-wheel double truck car body is 24 feet 2½ inches long over the couplers and is of standard specifications. It is equipped with swivel outriggers and track clamps.

The car body has two travel speeds, 4.2 mph and 2.1 mph in either direction. Gear ratios can be varied to give other than standard speeds up to 14 miles per hour for main line railroad work. It is equipped with two hand travel brakes as regular equipment. One of these brakes operates on the travel mechanism of the superstructure, the other acts on the truck body.

A New Weighing Batcher

A NEW 1929 Blaw-Knox weighing batcher which has been brought out by the Blaw-Knox Co., 667 Farmers Bank Bldg., Pittsburgh, Pa., is a fast and reliable outfit, suitable for road building or central mixing plant work. It is equipped with multiple beams so that the poises can be set for the weights of the various aggregates, there being one beam for each aggregate. The dial attachment provided affords speed,



The New Blaw-Knox Weighing Batcher Which Is Delivered Completely Assembled

convenience and accuracy of operation. When weighing sand and stone, neither of the poises need be moved. A simple latch is thrown when it is desired to engage or disengage the second scale beam. The beam box is entirely closed and it can be locked.

This weighing batcher can be shipped completely assembled, thus saving considerable time and labor in the field.

A New Close Quarter Crowd

A NEW crowd for use in extremely close quarters has been developed by the Northwest Engineering Co., 28 East Jackson Blvd., Chicago, Ill. This new crowd is not designed to take the place of the standard Northwest cable crowd but is designed to allow a machine to be equipped with an extremely short boom and long sticks, if desired, and enable the bucket to be extended, when necessary, out to the limits of the sticks independently of the hoist either before, during or after hoisting. Under ordinary circumstances crowding is accomplished in the normal manner with the standard crowd. But should the occasion demand forcing a bucket on



A Northwest Shovel Provided with the New Close Quarter Crowd

long sticks out beyond a short boom the new method provides this crowd, entirely independent of hoisting.

This combines in a single machine the uses of the standard Northwest cable crowd and an independent crowding mechanism without a high loss of hoisting power. It is especially valuable on basement or city street work, where space is limited and when the bucket must be extended high or wide for loading trucks.

The new crowd provides the feature of being able to hold the hoist at any desired point, meanwhile thrusting the bucket in or out without danger of dropping it and without having to hold it up with the engine. None of the engine power is divided between crowding and digging, thus leaving more power for actual digging operations. The mechanical features of the new crowd are extremely simple. In the standard Northwest shovel two drums are used and in the Close Quarter shovel a third drum is mounted in front of the regular left-hand drum of the machine. All operations may be executed in rapid succession enabling the bucket to be shaken with violence amply sufficient to dislodge sticky material.



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A NEW WEIGHING BATCHER

Complete information in regard to the new Blaw-Knox weighing batcher which is equipped with multiple beams for measuring various aggregates and which can be delivered completely assembled may be secured from the Blaw-Knox Co. (D. Clinton Grove, Adv. Mgr.), 667 Farmers Bank Bldg., Pittsburgh, Pa.

A NEW CHLORINATOR AND SCALES

In order to save floor space and insure the availability of the platform scales at the chlorinator to check the weight of chlorine cylinders at all times, the Paragon Mfg. Co. (R. V. Donnelly, Genl. Mgr.), Arlington, N. J., has developed a new combination chlorinator-platform scale, known as its Model DBP chlorinating scales, which will be of interest to contractors and municipal officials, who may secure detailed information direct from the company.

TREE MOVING

The Caterpillar Tractor Co. (W. H. Gardner, Adv. Mgr.), San Leandro, Calif., has issued a very interesting folder describing jobs of tree moving with Caterpillar power and giving the methods of a prominent park superintendent and a landscape architect.

ASPHALT PAVING TOOLS

This is the title of Bulletin No. 6 of the Barber Asphalt Co. (W. F. Hartzell, Adv. Mgr.), 1600 Arch St., Philadelphia, Pa., describing the Iroquois line of asphalt paving tools, including tampers and smoothers, sandals, rakes, hoes, cutters, shovels, scrapers, brooms, pouring, filling and melting pots, etc.

TRACTORS FOR ROAD MACHINERY

McCormick-Deering industrial tractors for powering practically every type of road building equipment are described in literature which may be secured from the International Harvester Co., of America, Inc., 606 So. Michigan Ave., Chicago, Ill.

A NEW AND IMPROVED SAFETY HOOK

The Anderson new and improved safety hook which can not accidentally become unfastened and which is made in a variety of designs and sizes to meet all requirements is described in literature which may be secured from the Public Works Equipment Co., Inc. (L. P. Anderson, Pres.), 1776 Broadway, New York.

A PUMPING HANDBOOK

The Novo Pumping Handbook describing the "Find Old" feature of the Novo pumps as well as containing information in regard to every type of contracting pumping may be secured from the Novo Engine Co. (W. C. Horn, Adv. Mgr.), 216 Porter St., Lansing, Mich.

A HEAVY DUTY PLUNGER FORCE PUMP

The Chain Belt Co. (R. A. Shilbauer, Adv. Mgr.), 766 Park Street, Milwaukee, Wis., will be glad to send to those interested Bulletin 180 which contains a complete description of its heavy duty plunger force pump for manhole pumping, trench and foundation work, drainage point installations, coffer dam and pier dewatering.

FOUR-CYLINDER MOTOR ROLLERS

The Huber roller catalog, which will be sent on request to those interested by the Huber Manufacturing Co. (A. W. Newby, Pres.), 330 E. Center Street, Marion, Ohio, contains a complete description of the Huber 4-cylinder motor roller which is made in four sizes, 5, 7, 10 and 12 tons.

MAST HOISTS FOR CONSTRUCTION JOBS

The Insley Mfg. Co. (Carl S. Wagner, Sales Mgr.), Indianapolis, Ind., will send to those interested complete data and prices on the Insley mast hoists which are quickly and easily erected, save the cost of a wooden tower and can be as easily dismantled after use and moved on to the next job.

SCRAPERS FOR ROAD WORK

The Killefer road scrapers which feature simple adjustment of load size to suit tractor power, an accurately adjusted "bite," heavy reversible shoes, two bolted-in interchangeable blades and ease of control are described in literature which may be secured from the Killefer Manufacturing Co. (R. P. Lehr, Adv. Mgr.), 5535 Downey Road, Los Angeles, Calif.

A NEW HOIST

A new hoist, the Flor-Ox 35, among the features of which are roller bearing thrusts for friction clutches, silent chain drive enclosed in dust proof casing, machine cut teeth on all main gears and pinions, positive release device on friction levers, and a rope pull of 5,000 pounds at 165 feet per minute, is described in literature which may be secured from the S. Flory Manufacturing Co. (E. G. Markley, Gen. Mgr.), Bangor, Pa.

A DOUBLE SLIDING SCREED FINISHER

A. W. French & Co., 8524 Vincennes Ave., Chicago, Ill., will send to those interested full information in regard to the Ord double sliding screed finisher, which, because of the slow even sliding motion of the two screeds in opposite directions, eliminates irregularities in the road and insures a uniform surface.

WEIGHING BATCHER PLANTS

Literature describing the Heltzel weighing Agrabatchers, which indicate on a 3-foot dial every pound of material passing through, may be secured from the Heltzel Steel Form & Iron Co. (W. J. Savage, Vice-Pres.), Warren, Ohio.

A STURDY AND POWERFUL SHOVEL

The Hercules Motors Corp. (John Keplinger, Director of Sales), Canton, Ohio, will send to any one interested complete information in regard to its sturdy and powerful Hercules shovel designed for all kinds of heavy and difficult work.

TRAILERS FOR EQUIPMENT MOVING

Trailers for highway machinery which will pick up heavy pieces of equipment at one job and transport them quickly and conveniently to the next job are described in literature which may be secured from the Highway Trailer Co. (H. W. Helms, Gen. Mgr.), Edgerton, Wisc.

DIESEL DRIVE FOR ANGLE COMPOUND COMPRESSORS

Bulletin No. 33-L describes in detail the new Sullivan angle compound compressors, which range in capacity from 400 to 2,600 cubic feet of free air per minute and which are diesel driven, and may be secured from the Sullivan Machinery Co. (S. B. King, Adv. Mgr.), 162 South Michigan Ave., Chicago, Ill.

A FOUR-DRIVE TRACTOR

A booklet describing the Fitch four-drive tractor which is designed for all kinds of work and which gives a maximum amount of traction may be secured from the Four Drive Tractor Co. (V. A. Van Horn, Pres.), Big Rapids, Mich.

LEANING WHEEL ROAD GRADERS

The Austin-Western Road Machinery Co. (H. F. Barrows, Adv. Mgr.), 400 N. Michigan Ave., Chicago, Ill., has issued a well-illustrated folder describing the new 1929 Model Austin Mammoth Senior leaning wheel grader with telescopic axle and disc wheels.

A NEW HEAVY-DUTY PULL SHOVEL

A new heavy duty pull shovel with a number of outstanding features, including a shock absorbing principle in the boom base and the dipper stick and a specially designed job frame, is described in a folder which may be secured from Koehring Co. (O. C. Dahlman, Adv. Mgr.), Milwaukee, Wis.

STEEL JOISTS

Copies of a specification covering the vital points of design, erection and use of steel joists in building construction may be secured from the Steel Joist Institute, 1736 Dime Bank Bldg., Detroit, Mich.

A DIESEL DRAG SHOVEL

Bacyrus-Erie (F. O. Wyse, Asst. Adv. Mgr.), South Milwaukee, Wis., will be pleased to send to those interested complete information in regard to its new diesel drag shovel which operates at extremely low fuel cost and may be used as a dragline, crane, shovel or clamshell.

A WEIGHING HOPPER WITH AN ALL-STEEL SCALE

Bulletin 150-B of the Butler Bin Co. (A. R. Morton, Adv. Mgr.), Waukesha, Wis., contains a complete description of the new Butler weighing hopper which is equipped with an all-steel scale and which may be easily and quickly installed on any steel, wood or cement bin.

A NEW STEEL ROAD FORM

The Truscon Steel Co. (Oscar W. Loew, Dir., Adv. and Sales Promotion), Youngstown, Ohio, will be glad to send to those interested, complete information in regard to its new steel road form, made of 3/16-inch steel, to which all joint locks and other built-up parts are attached by 3/16-inch hot-driven rivets.

A SELF-CAULKING MATERIAL FOR CAST IRON PIPE

A complete description of Leadite, a self-caulking material for use in joining cast iron pipe which facilitates pipe laying, may be secured from the Leadite Co. (George McKay, Jr., Pres.), Land Title Bldg., Philadelphia, Pa.

ENGINE-POWERED CENTRIFUGAL PUMP UNIT

Domestic Engine & Pump Co. (W. E. Barbour, Sales Mgr.), Shipensburg, Pa., will be pleased to send literature describing the Domestic engine-powered direct-drive centrifugal pump unit with a vacuum primer.

CARE OF AN ENGINE

A booklet, in the form of an insurance policy, and entitled Waukesha Engine Insurance Policy, which is put out by the Waukesha Motor Co. (P. C. Ritchie, Adv. Mgr.), Waukesha, Wis., describes Waukesha engines and contains valuable data on the use and care of them.

PORTABLE AND STATIONARY TAR HEATERS

Portable and stationary tar heaters which range in size from 25 to 200 gallons are described in Pamphlet No. 15 which the Jos. Honhorst Co. (L. A. Hess, Adv. Mgr.), 1016 W. 6th St., Cincinnati, Ohio, will be glad to send to those interested.

A MIDGET HAMMER

A new catalog No. 124 entitled "Pile Driving Machinery and Foundation Equipment," describing the Union No. 9 Midget Hammer, which is designed to come within the range of the pavement breaker and rock drill type of hammer but with less air consumption, weighs 97 pounds, delivers over 250 blows per minute and strikes a 275-pound blow, may be secured from the Union Iron Works (W. G. Schalscha, Secy.), West Shore Siding, Hoboken, N. J.

The No. 7-A TURBINE AIR CONCRETE SURFACER

This is the lightest weight, fastest cutting and easiest handled Concrete Surfacers on the market today.



Weight with Stone, only 9 Pounds

A small, light, fast cutting, high powered machine. For close corners and for scaffold work, this surfacer is unexcelled.

Other Turbine Surfacers are equally well adapted to other types of concrete surfacing work.

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Painted red—Height 30 in.—For 2 x 6 stringer. Ruggedly constructed, self-locking, cannot wobble. Assembled and dismantled easily by one man. Heavy enough to withstand high-wind pressure. Placed anywhere on stringer, cleats eliminated. Initial cost is only cost—repairing eliminated.

When your wood supports need replacement or repairs get CLEVELAND STEEL BARRICADE SUPPORTS. They are PERMANENT EQUIPMENT and a REAL ASSET.

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Power PLOW Scraper

SUPER-HEAT-RESISTING VALVES



Try these valves on your toughest valve jobs.

They'll last longer and give better engine performance with fewer regrinds, because they defy distortion and destruction by heat.

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Used the past ten years on diesel and gas engines, and are now available for popular makes of contractors engines.

Our engineers will gladly help solve your valve problems. Send us a line.

INDUSTRIAL ENGINE PARTS, INC.

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A NEW METHOD OF RESURFACING A HARD SURFACE

A folder describing the new Greco method of resurfacing a hard surface by means of a special process of applying asphaltic cement may be secured from the Good Roads Equipment Co. (R. A. Perrott, Gen. Mgr.), City Center Bldg., Philadelphia, Pa.

ROADSIDE TORCHES AND SIGNAL LIGHTS

Complete information in regard to the Toledo roadside torch which will burn in any kind of weather and under any conditions may be secured from the Toledo Pressed Steel Co. (Lyman W. Close, Vice-Pres.), Toledo, Ohio.

A NEW SERIES OF GASOLINE LOCOMOTIVES

The new 1200 series of gasoline-powered, gear-driven, industrial locomotives in a variety of sizes and track gages which are adapted for handling either industrial cars or railroad cars or for any service where track haulage may be employed, is described in literature which may be secured from the Locomotive Division of the Cincinnati Car Corp. (H. R. Sykes, Sales Mgr.), Winton Place, Cincinnati, Ohio.

ROAD MATERIAL SPREADERS

Road material spreaders, which may be attached to any dump truck, and which lay down uniformly the exact amount of material required, from sand to 2½-inch stone, are described in literature which the Stolle Road Equipment Co., Inc. (Frank C. Stolle, Pres.), 321 South Grand Blvd., St. Louis, Mo., will be glad to send to those interested.

COPPER BEARING STEEL RIMS

Catalog 100 contains a complete description of Beaumont storage bins, constructed of copper bearing steel plates in all standard sizes with full gravity discharge, and may be secured from the Beaumont Manufacturing Co. (W. G. Davenport, Mgr., S. G. S. Dept.), 330 Arch St., Philadelphia, Pa.

ALL-STEEL HAND HOISTS

Beebe Bros. (R. T. Beebe, Pres.), 3219 First Ave., So. Seattle, Wash., will be glad to send to those interested a descriptive circular with full details in regard to the Beebe all steel hand hoists.

A FULL LINE OF ROLLERS

A complete description of the full line of Buffalo-Springfield road rollers, with or without scarifier or other attachments, may be secured from the Buffalo-Springfield Roller Co. (J. F. Richardson, Sales Mgr.), Springfield, Ohio.

AN OIL BURNING TOOL HEATER

An oil burning tool heater for use in asphalt street work which starts in 5 minutes, heats cool tools in 15 minutes, will not burn tools, has no sparks, smoke or ashes, is unaffected by wind or rain and has warming space for 6 asphalt buckets, is described in literature which the Chaussee Oil Burner Co. (W. McK. White, Pres.), Elkhart, Ind., will be glad to send to those interested.

STEEL FOR CONSTRUCTION EQUIPMENT

The Farrell-Beck Steel Foundry Co., Sandusky, Ohio, will be pleased to send to any one interested complete information in regard to Farrell's 85, a cast steel for use in construction equipment.

MATERIAL TOWER EQUIPPED WITH OUTSIDE CONCRETE BUCKET

Bulletin J T-101 describing the double diagonal tubular material tower equipped with a platform elevator and an outside concrete hoist bucket may be secured by those interested from Jaeger Machine Co., 701 Dublin Avenue, Columbus, Ohio.

A NEW CART-TYPE FULL BOTTOM DUMP WAGON

LaPlant-Chaste Manufacturing Co., Inc. (R. E. Chaste, Mgr.), 2830 First Ave., Cedar Rapids, Iowa, will be glad to send to any one interested the latest catalog describing the Road-Layer bottom dump wagons, Models J-15 and J-18, which are designed for use with a tractor and which are equipped with tractor type wheels.

A NEW CLOSE QUARTER CROWD

A new crowd for use in extremely close quarters which allows a machine to be equipped with extremely short boom and long sticks and enables the bucket to be extended, when necessary, out to the limits of the sticks independently of the hoists either before, during or after hoisting is described in literature which may be secured from the Northwest Engineering Co. (G. C. Williams, Adv. Mgr.), 28 East Jackson Blvd., Chicago, Ill.

A NEW STEELDECK ROOFING

Literature describing the new steeldeck roofing made in 6-inch widths of Armo Ingot Iron and which presents a smooth unbroken surface for receiving insulating materials, may be secured from the Genfre Steel Co. (W. H. Phillips, Adv. Mgr.), Youngstown, Ohio.

LOADING LAYOUTS

This is the title of a booklet, describing B-G belt feeders and conveyors and containing a number of cost cutting stories on actual material moving jobs, and may be secured from the Barber-Greene Co. (James H. Gregory, Pub. Mgr.), 498 W. Park Avenue, Aurora, Ill.

A NEW DOUBLE DIAPHRAGM PUMPING UNIT

The John Lanson Manufacturing Co. (R. G. Lanson, Mgr.), 11 Jackson Street, New Holstein, Wis., will be glad to send to those interested complete information in regard to the new double diaphragm pumping unit, equipped with a 3-inch pump and powered by a 2½ to 3-horsepower Lanson vertical radiator-cooled engine, with a capacity of 7,000 to 9,000 gallons per hour.

A DELIVERY BODY FOR HANDLING READY-MIXED CONCRETE

Complete information in regard to the R. M. C. tank for handling ready-mixed concrete, which is designed for use on any standard truck and which insures an even consistency of the concrete by a process of rotation through a special engine governor, may be secured from the Portland Concrete Machines Co., 53 West Jackson Blvd., Chicago, Ill.

A NEW PORTABLE ELECTRIC HAND SAW

A new electric saw, with the circular saw made in three sizes, 6, 8 and 10 inches in diameter, which will cross cut or rip lumber up to 3½ inches, and which may be operated on either direct or alternating current, is described in literature which may be secured from the Black & Decker Manufacturing Co., Towson, Md.

TRUCK CRANES

Folder 452-J "The Story of a ¼-Yard Machine" describes the development of the truck crane and its uses and advantages in the construction field to-day and may be secured from the Universal Crane Co. (J. L. Belts, Adv. Mgr.), 1361 E. 28th St., Lorain, Ohio.

THREE-PULLEY TROUGHING IDLERS

The Conveying Weigher Co., 90 West Street, New York, will be glad to send to those interested complete information in regard to its Super-Conweigh three-pulley troughing idlers which are equipped with malleable outboard brackets, have Alemite lubrication and either Timken roller or S. R. B. ball bearings.

A COMPLETE LINE OF CLAM SHELL BUCKETS

Bucket Bulletin C, containing a complete description of the new Williams Champion line of durable and speedy super-buckets, may be secured by those interested from the G. H. Williams Co. (A. J. Lich-tinger, Asst. Sales Mgr.), 609 Haybarger Lane, Erie, Pa.

A NEW HEAVY-DUTY CRAWLER TRACTOR

The Trackson Co. (L. E. Dauer, Sales Mgr.), 519 Clinton Street, Milwaukee, Wis., will send to any one interested complete details in regard to the new Model LH, a powerful crawler tractor, designed for use with other equipment such as motor graders, bulldozers, and diggers, and having among its features all-steel construction, few working parts, non-clogging tracks and inserted manganese drive teeth on rear sprockets.

CURING CONCRETE

Two ways of curing concrete, either by using Solvay calcium chloride as a part of the mix or by applying it to the surface with a Solvay hand spreader, are described in the 24-page Concrete Curing Booklet No. 2051 which the Solvay Sales Corp., 40 Rector Street, New York, will be glad to send to those interested.

PORTABLE BELT CONVEYORS

Bulletin No. 66-C, E. of the Fairfield Engineering Co. (J. B. Bray, Sales Mgr.), Marion, Ohio, contains a complete description of the Fairfield portable belt conveyors which are manufactured in lengths of 30 to 60 feet, 20 or 24 inches wide, with a maximum capacity made possible by wide troughed belts and operated by either gasoline or electric power.

A COMPLETE LINE OF DERRICKS AND WINCHES

The Sagen Derrick Co., 3101 Grand Avenue, Chicago, Ill., will be glad to send to any one interested complete data and prices of its entire line of derricks and winches for use in construction.

DRAWING INKS

Color Chart A of the Pelican Works-Gunther Wagner, Inc., 34 East 23rd Street, New York, contains information about the Pelican drawing inks in black and white and 18 brilliant shades and will be of interest to draftsmen and engineers.

A NEW SHOVEL

A description of the new Orton shovel, among the features of which is the operator's position giving him a clear unobstructed view of the work, may be secured from the Orton Crane & Shovel Co. (P. A. Orton, Jr., Sales Mgr.), 608 South Dearborn Street, Chicago, Ill.

A PROCESS FOR CURING CONCRETE

The booklet "Curing Concrete Without Dirt or Water by the Hunt Process" which describes this special process of curing concrete, may be obtained from McEverlast, Inc., 111 West Seventh Street, Los Angeles, Calif.

A CRANE WITH AUTOMOTIVE GEAR-SHIFT

Mantitowce Engineering Works (C. C. Miller, Sales Mgr.), Mantitowce, Wis., will be glad to send to those interested complete information in regard to the Speedcrane, the features of which include an automotive gear-shift, ease of operation, speed, and all travel gears and clutches fully enclosed and running in oil.

ACCURATE AND DEPENDABLE METERS

The entire line of Trident water meters which are designed for accuracy of registration and low cost of maintenance, is described in literature which may be secured from the Neptune Meter Co., 50 East 42nd Street, New York.

A NEW FOUR-SPEED TRACTOR

The United Tractor & Equipment Co. (Milton W. Anderson, Pres.), 612 North Michigan Avenue, Chicago, Ill., will be glad to send to those interested complete information in regard to the new four-speed United tractor which has a drawbar pull of 2,500 to 3,500 pounds and is powered with a specially designed 4-cylinder water-cooled Continental motor.

CHAIN FOR CRANES, DREDGES AND HEAVY DUTY

This is the title of a folder describing the H. B. and Ajax dredge chains, particularly designed and welded for heavy duty, and may be secured from the American Chain Co., Inc., Bridgeport, Conn.

ALL-STEEL HEAVY DUTY TOOL BOXES

Bulletin No. E-11 containing a complete description of the Littleford all steel utility, heavy duty and stationary tool boxes which offer triple protection for tools and small equipment may be secured from Littleford Brothers, 457 East Pearl Street, Cincinnati, Ohio.

A NEW VERTICAL CAPSTAN

The Lidgerwood Manufacturing Co. (F. D. Hooper, Sales Mgr.), Elizabeth, N. J., will be glad to send to those interested complete information in regard to the new Tugmore capstan, powered with either a gasoline or electric motor, both of weather-tight construction, and requiring a space of 25 x 34 inches.

A NEW HAND-ROTATED STOPPER

A description of the new CP-146W wet stopper combining high drilling speed, light weight, short overall length, ease of operation, low upkeep and convenient air control for difficult digging conditions, may be secured from the Chicago Pneumatic Tool Co. (H. H. Sherman, Mgr., Publicity Dept.), 6 East 44th Street, New York.

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FEBRUARY, 1929

25 Cents, \$1 a Year

Contractors and Engineers Monthly



Concrete Chuting Equipment
North Station, Boston, Mass.

See article page 107

ER STORES

Don't do it!

If you were like a cat, it might be all right to take a chance on one of your lives, but you're not.

You have but *one life*; guard it well. Wire Rope goes into a hazardous service. The right grade of rope in the right service is as safe as anything can be.

Be sure you use the right rope. Don't take a salesmen's word for its grade. Insist upon Factory proof. The tag on the rope or mark on a reel is no proof of grade.

WILLIAMSPORT WIRE ROPE

Is Telfax Tape Marked and Factory Certified

Look for the "Telfax" Tape in the hemp core. It will tell you exactly what grade it is—built into the rope by the factory man who *knows*.

You're not a cat—You have only one life. Don't guess—Be *SURE*. Use "Williamsport."

WILLIAMSPORT WIRE ROPE CO.

Main Office and Works
Williamsport, Pa.

General Sales Office
Peoples Gas Bldg., Chicago

The Largest Exclusive Wire Rope Plant in America



MARCH, 1929

62



Cents \$1 a Year

Contractors *and* Engineers Monthly



Dirt Moving — One of the Most
Important Construction Activities
Where Proper Equipment Produces Profits



The Pick of All One-Baggers

JOB tested and job proven. The kind of mixer you can depend on to place a maximum amount of concrete per day. It "eats up" that dry, sticky mix now specified on many jobs.

The *Marsh-Capron Master 7*—is the *Only Fully Modernized One Bagger Made*. Built to stand up and take it. Compact—rigid as a steel bridge yet light enough so men can easily handle it. Speed in mixing—speed in moving from job to job. 30% faster, any way you look at it. Compare it on features, quality, performance, price—and it's the pick of all One Baggers.

Get your Bulletin on this new Marsh-Capron

LOOK OVER THESE IMPROVEMENTS—

Timken Equipped
All models spring mounted
with roller bearing wheels.
Rubber-tired and steel wheels
interchangeable.
Diamond Roller Chain Drive
—Fully enclosed Running in
Oil.
Marsh-Capron Rail Track
Guaranteed for life of Mixer.
Wonder Quick Water Tank—
fast, accurate, easy operating.

Construction Machinery Company

447 Vinton St., Waterloo, Ia.

Makers of Wonder Tilting Mixers; Marsh-Capron Drum Type Mixers; C. M. C.
Hoists, Kern Hoists; Mechanical Hoeman Plaster Mixers; Power Sawyers.
Plants at Waterloo and Chicago Heights, Ill.

MONTHLY

APRIL, 1929

25 Cents, \$1 a Year

Contractors *and* Engineers Monthly



The Hudson River Bridge between New York and New Jersey, showing the New York anchorage in the foreground and the first steel tower.

a Year
thly by
J. S. A.

The Pony-Ditcher Eats Dirt, But Dirt Can't Eat the Bearings



IF you believe that all ditchers are alike it's because you don't know the latest Topping Pony-Ditcher. Built for speed right from the ground up, it eats dirt and is so constructed that it likes it. This better built ditcher will keep going and be on the job digging out dollars for you when an ordinary machine is taking time out for repairs.

For example, dirt doesn't bother the bearings on the Pony-Ditcher because all high speed shafts are mounted on ball bearings and run in oil. Nor does clay clog in the buckets because each is individually self-cleaning. Split sprockets with cut teeth and made of special steel, electrically welded frames for strength without excess weight and a full crawler mounting with modified one-shot lubrication help make this ditcher a buy that you will find hard to duplicate.

Pony-Ditcher capacities range from 13 to 30 inches in width by 7½ feet deep. An interesting booklet has been prepared giving complete information on this machine. Write for a copy.

This shows the dirt-proof ball bearings used in the Pony-Ditcher. These bearings are mounted on all high speed shafts.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST

S MONTHLY

MAY, 1929

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6.2

Contractors and Engineers Monthly



Two 14-S. Miller
Working on Road
near in Milwaukee

WHY WASTE PISTON STROKES?

Thor Puts Them to Work for You



The Thor "6" With Super Charger Gives You 26% More Air

In all compressors but the THOR, there is an idle stroke—the downward stroke—which does not compress air. These idle strokes increase your costs and help to drain your profits.

In the THOR SIX Air Compressor, the idle or downward stroke is put to work by means of the Rix Super-Charger. This exclusive, patented feature utilizes the idle stroke of the piston to compress the additional air the THOR delivers. The THOR SIX Air Compressor delivers more air than any other compressor of the same size because it does not waste piston strokes. The THOR 116-foot rated capacity compressor actually delivers 96 feet of air per minute. The Thor 250-foot rated capacity compressor actually delivers 210 feet of air per minute. Take any other compressor and compare its rated capacity and actual delivery of air with THOR performance and you will realize why the THOR is the best compressor buy on the market.

On the basis of "more air for your money" the THOR deserves an investigation on your part. Get the facts before you buy. Compare results—check performances—and then decide. You'll find that you'll be money ahead.

We also make a complete line of Paving Breakers, Clay Diggers, Backfill Tampers, Calking Hammers and Concrete Surfacing Grinders. Write for literature.

INDEPENDENT PNEUMATIC TOOL CO.

**PNEUMATIC
TOOLS**

GENERAL OFFICES
**248 So. Jefferson St.
CHICAGO**

**ELECTRIC
TOOLS**

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a Year
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U. S. A.

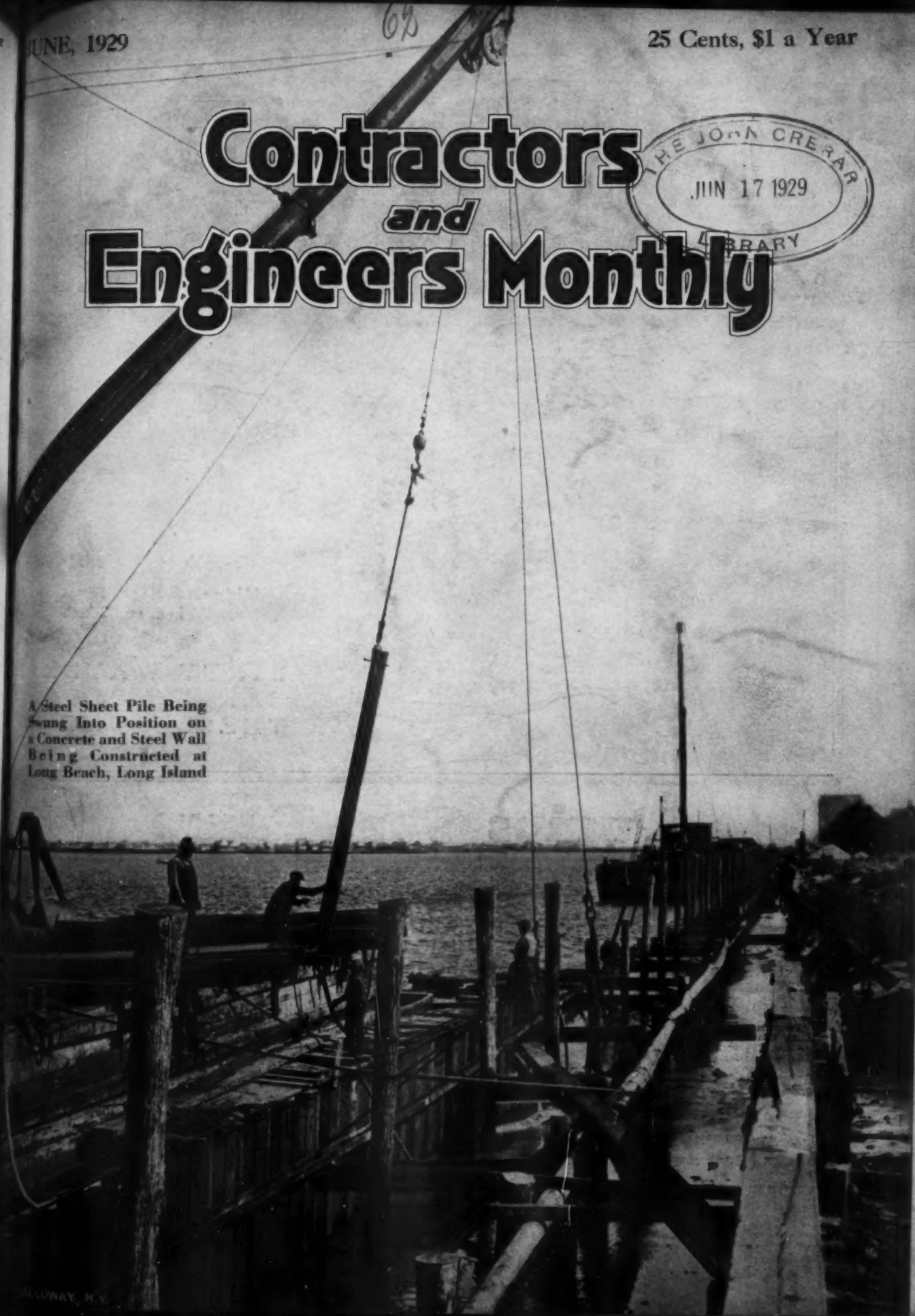
JUNE, 1929

25 Cents, \$1 a Year

Contractors *and* Engineers Monthly



A Steel Sheet Pile Being
Swung Into Position on
a Concrete and Steel Wall
Being Constructed at
Long Beach, Long Island



ALLOWAY, N.Y.

TRENCHMARINE

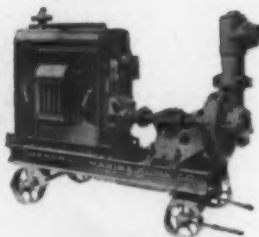
Portable Pumps



"TRENCHMARINE"
Midget Portable Pump
Sizes 1½ inch and 2 inch

**DIRTY WATER
CANNOT CLOG
THESE PUMPS**

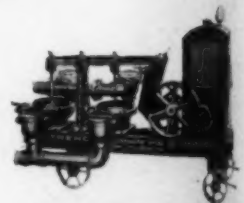
Pumps That Pump



**"Trenchmarine" Heavy
Duty Centrifugal Pump**
—Sizes 2½ inch to 10
inch inclusive.

There is a "Trenchmarine" pump for every purpose—priced reasonably—and built for long, hard service. Ask your supply house for information about "Trenchmarine" Diaphragm and Centrifugal pumping outfits, or write directly to us.

Distributors Inquiries Invited



**"Trenchmarine" Dia-
phragm Ball Valve Lift
and Force Pump—Single
and Double models—
Sizes 3 inch and 4 inch.**

TRENCH & MARINE PUMP CO.
126 WEST 22nd STREET NEW YORK, N.Y.

Please advise the publishers if you find any inaccuracies in this list.

Where to Purchase

A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment. The index of Advertisers faces the inside back cover. When writing to advertisers please mention the CONTRACTORS & ENGINEERS MONTHLY. A star (*) before the manufacturer's name indicates that his advertisement appears in this issue.

This index is published as an aid to the reader, but the publishers assume no responsibility for errors or omissions.

AIR COMPRESSORS

- *Buhl Company, Chicago
- *Domestic Eng. & Pump Co., Shippensburg, Pa.
- *Independent Pa. Tool Co., Chicago, Ill.
- *Hove Engine Co., Lansing, Mich.
- *O. K. Clutch & Mach. Co., Columbia, Pa.
- *Stever Mfg. & Eng. Co., Freeport, Ill.
- *Sullivan Machinery Co., Chicago
- *Acme Road Machy. Co., Frankfort, N. Y.
- *Allis-Chalmers Mfg. Co., Milwaukee
- *American Steam Pump Co., Battle Creek, Mich.
- *Barnes Mfg. Co., Mansfield, O.
- *Cement-Gun Co., Allentown, Pa.
- *Chicago Pneumatic Tool Co., N. Y.
- *Cook Motor Co., Delaware, O.
- *Curtis Pneumatic Machy. Co., St. Louis, Mo.
- *De Laval Steam Turbine Co., Trenton, N. J.
- *Fairbanks, Morse & Co., Chicago
- *Gardner-Denver Co., Quincy, Ill.
- *General Electric Co., Schenectady, N. Y.
- *Hardie-Tynes Mfg. Co., Birmingham, Ala.
- *Indiana Air Pump Co., Indianapolis, Ind.
- *Ingersoll-Rand Co., N. Y.
- *Nordberg Mfg. Co., Milwaukee, Wis.
- *Norwalk Iron Works Co., So. Norwalk, Conn.
- *Schramm, Inc., West Chester, Pa.
- *United Iron Works, Kansas City, Mo.
- *Westinghouse Traction Brake Co., Wilmerding, Pa.
- *Worthington Pump & Machinery Corp., N. Y.

AIR COMPRESSORS, PORTABLE

- *Buhl Co., Chicago
- *Chain Belt Co., Milwaukee, Wis.
- *Domestic Eng. & Pump Co., Shippensburg, Pa.
- *Independent Pneum. Tool Co., Chicago
- *O. K. Clutch & Mach. Co., Columbia, Pa.
- *Sullivan Machinery Co., Chicago
- *Cement-Gun Co., Allentown, Pa.
- *Chicago Pneumatic Tool Co., New York
- *Curtis Pneumatic Machy. Co., St. Louis, Mo.
- *Ingersoll-Rand Co., New York
- *Metalweld, Inc., Philadelphia, Pa.
- *National Brake & Electric Co., Milwaukee
- *Schramm, Inc., West Chester, Pa.
- *Simons Paint Spray Brush Co., Dayton, O.

ARTESIAN WELL DRILLS & PUMPS

- *American Well Works, Aurora, Ill.
- *Ingersoll-Rand Co., New York
- *Star Drilling Machine Co., Akron, O.

ASPHALT

- *Barber Asphalt Co., Philadelphia
- *Barrett Co., N. Y.
- *Standard Oil Co. (Ind.), Chicago
- *Standard Oil Co. (N. Y.), N. Y.
- *Warren Bros. Co., Boston
- *Atlantic Ref. & Asph. Corp., Philadelphia
- *Ky. Rock Asph. Co., Louisville, Ky.
- *Natural Rk. Asph. Corp., Owensboro, Ky.
- *New Orleans Ref. Co., New Orleans
- *Pioneer Asph. Co., Lawrenceville, Ill.
- *Sinclair Ref. Co., Chicago
- *Standard Oil Co. of Cal., S. Francisco
- *Standard Oil Co. of La., N. Orleans
- *Standard Oil Co. of N. J., Newark
- *Texas Co., N. Y.

ASPHALT BLOCK

- *Hastings Pavement Co., N. Y.

ASPHALT BRICK

- *Asphalt Brick Co., St. Louis

ASPHALT CUTTERS

- *Independent Pneumatic Tool Co., Chicago
- *Sullivan Machinery Co., Chicago
- *Chicago Pneumatic Tool Co., N. Y.
- *Cleveland Rock Drill Co., Cleveland, O.
- *Dayton Pneum. Tool Co., Dayton, O.
- *Gardner-Denver Co., Quincy, Ill.
- *Ingersoll-Rand Co., N. Y.

Littleford Bros., Cincinnati.

ASPHALT KETTLES (See Kettles for Asphalt and Tar Heating)

ASPHALT PLANTS, TOOLS, ETC.

- *Barber Asphalt Co., Philadelphia
- *Chausse Oil Burner Co., Elkhart, Ind.
- *Connery & Company, Philadelphia
- *Warren Bros. Co., Boston
- *Aeroll Burner Co., West New York, N. J.
- *American Fin-Mix Co., Chicago
- *Charleroi Iron Wks., Charleroi, Pa.
- *F. D. Cummer & Son Co., Cleveland, O.
- *J. D. Farasey Mfg. Co., Cleveland, O.
- *Hetherington & Berner, Indianapolis
- *Hauck Mfg. Co., Brooklyn, N. Y.
- *Littleford Bros., Cincinnati
- *Merriman Asphalt Plant, Inc., Lima, O.

ASPHALT POURING POTS (See Pots, Asphalt Pouring)

ASPHALT ROLLERS (See Road Rollers)

ASPHALT SURFACE HEATERS

- *Barber Asphalt Co., Philadelphia
- *Chausse Oil Burner Co., Elkhart, Ind.
- *Aeroll Burner Co., West New York, N. J.
- *Equitable Asp. Maint. Co., Kan. City, Mo.
- *Hauck Mfg. Co., Brooklyn, N. Y.

BACKPACKERS

- *Baker Mfg. Co., Springfield, Ill.
- *Bay City Shovels, Inc., Bay City, Mich.
- *Bucyrus-Erie Co., Erie, Pa.
- *Construction Machy. Co., Waterloo, Ia.
- *General Wheelbarrow Co., Cleveland
- *Kochring Co., Milwaukee, Wis.
- *Osgood Company, Marion, Ohio
- *Parsons Co., Newton, Ia.
- *Austin Mach. Corp., Muskegon, Mich.
- *Buckeye Trac. Ditcher Co., Findlay, O.
- *Byers Mach. Co., Ravenna, O.
- *Erted Mfg. Co., Portland, Ore.
- *General Excavator Co., Marion, O.
- *Harnischfeger Corp., Milwaukee, Wis.
- *LaPlant-Chaste Mfg. Co., Cedar Rapids, Iowa
- *Link-Belt Co., Chicago
- *Miami Trailer-Scraper Co., Troy, O.
- *Orton Crane & Shovel Co., Chicago
- *Star Drilling Mach. Co., Akron, O.
- *Speeder Machy. Corp., Cedar Rapids, Iowa
- *Waterman Corp., Detroit
- *Weller Mfg. Co., Chicago

BAGS

- *Bates Valve Bag Corp., Chicago

BAG TRUCKS

- *Bates Valve Bag Corp., Chicago
- *Case Crane & Engg. Co., Columbus, O.

BAR BENDERS AND CUTTERS

- *Kochring Co., Milwaukee, Wis.
- *Ransome Conc. Machy. Co., Danellen, N. J.
- *Buffalo Forge Co., Buffalo, N. Y.
- *Concrete Steel Co., N. Y.
- *Electric Welding Co., Pittsburgh
- *D. A. Hinman & Co., Sandwich, Ill.
- *J. L. Gleason & Co., Boston, Mass.
- *Kardong Bros., Minneapolis
- *McKenna Co., Cleveland, O.

BARRICADE SUPPORTS

- *Cleveland Steel Spec. Corp., Cleveland, O.

BAR TIES

- *Bates Valve Bag Corp., Chicago
- *Symons Clamp & Mfg. Co., Chicago, Ill.

BATCH BOXES

- *Blaw-Knox Co., Pittsburgh, Pa.
- *Butler Bin Co., Waukesha, Wis.
- *Erie Steel Const. Co., Erie, Pa.
- *Fairfield Engineering Co., Marion, Ohio
- *Helsel Stl. Form & Ir. Co., Warren, O.
- *Jos. Henrich Co., Cincinnati

- *Lakewood Eng. Co., Cleveland, O.
- *Easton Car & Const. Co., Easton, Pa.
- *Easton Car & Const. Co. of Mo., Kansas C., Mo.
- *Koppel Ind. Car & Equip. Co., Koppel, Pa.
- *Littleford Bros., Cincinnati
- *Jas. B. Seaverns Co., Batavia, Ill.
- *Western Wheeled Scraper Co., Aurora, Ill.

BATCHERS (For Measuring Aggregates)

- *Blaw-Knox Co., Pittsburgh, Pa.
- *Butler Bin Co., Waukesha, Wis.
- *Erie Steel Const. Co., Erie, Pa.
- *Fairfield Engineering Co., Marion, Ohio
- *Helsel Stl. Form & Ir. Co., Warren, O.
- *Superior Engineering Co., Warren, Ohio

BEARINGS

- *Fafnir Bearing Co., New Britain, Conn.
- *Hyatt Roller Bear. Co., Harrison, N. J.
- *New Departure Mfg. Co., Bristol, Conn.
- *S. K. F. Industries, New York
- *Timken Roller Bearing Co., Canton, O.

BINS, STORAGE

- *Austin-Western Rd. Mach. Co., Chicago
- *Beaumont Mfg. Co., Philadelphia
- *Blaw-Knox Co., Pittsburgh, Pa.
- *The Burch Corp., Crestline, Ohio
- *Butler Bin Co., Waukesha, Wis.
- *Erie Steel Const. Co., Erie, Pa.
- *Fairfield Engineering Co., Marion, Ohio
- *Good Roads Mch. Co., Kennett Sq., Pa.
- *Helsel Stl. Form & Ir. Co., Warren, Ohio
- *Industrial Brownhoist Corp., Cleveland, O.
- *Ransome Conc. Machy. Co., Danellen, N. J.
- *Austin Mfg. Co., Chicago
- *Birmingham Tank Co., Birmingham, Ala.
- *Canton Art Metal Co., Canton, Ohio
- *Easton Car & Const'n. Co., Easton, Pa.
- *Gallen Iron Works & Mfg. Co., Gallen, Ohio
- *C. S. Johnson Co., Champaign, Ill.
- *Lancaster Iron Works, Inc., Lancaster, Pa.
- *Link-Belt Co., Chicago
- *Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa.
- *Russell Grader Mfg. Co., Minneapolis
- *Jas. B. Seaverns Co., Batavia, Ill.
- *Superior Engineering Co., Warren, Ohio
- *Universal Rd. Mach. Co., Kingston, N. Y.
- *Weller Mfg. Co., Chicago

BLADES FOR GRADERS & SNOW PLOWS

- *General Wheelbarrow Co., Cleveland
- *J. D. Adams & Co., Indianapolis
- *Gallen Iron Works & Mfg. Co., Gallen, Ohio
- *Russell Grader Mfg. Co., Minneapolis
- *Shunk Mfg. Co., Bucyrus, Ohio

BLAST HOLE DRILLING MACHINES (See Well Drilling and Blast Hole Machines)

BLASTING POWDER (See Explosives)

BLOCKS AND TACKLE

- *Boston & Lockport Bk. Co., Boston, Mass.
- *Debbis Fdry. & Mach. Co., Niagara Falls, N. Y.
- *Western Block Co., Lockport, N. Y.

BLOW TORCHES

- *Chausse Oil Burner Co., Elkhart, Ind.
- *O. H. Williams Co., Erie, Pa.
- *Everhot Mfg. Co., Maywood, Ill.

BLUE PRINT MACHINES

- *Paragon Mach. Co., Rochester, N. Y.
- *O. F. Pease Co., Chicago
- *Wickes Bros., Saginaw, Mich.

BOILERS

- *Johnston Bros., Inc., Ferrysburg, Mich.
- *Chandler & Taylor Co., Indianapolis
- *Chatta. Boiler & Tank Co., Chatta., Tenn.
- *R. D. Cole Mfg. Co., Newnan, Ga.
- *Combustion Eng. Corp., N. Y.
- *Erie City Iron Works, Erie, Pa.
- *Hartley Bkr. Works, Montgomery, Ala.
- *Hedges-Walsh-Weidner Co., Chattanooga, Tenn.
- *Heine Boiler Co., St. Louis, Mo.
- *E. Keeler Co., Williamsport, Pa.

For Directory of Local Distributors of Contractors' Equipment, See Pages 99 to 122

Where to Purchase

BOILERS, (Continued)

Ladd Water Tube Bldg. Co., Pittsburgh, Pa.
V. Laffel & Co., Springfield, Ohio
Lord & Burnham Co., Irvington, N. Y.
Murray Iron Works Co., Burlington, Iowa
Nagle Eng. & Bldg. Works, Erie, Pa.
New Born Iron Works & Sup. Co., New Born, N. C.
Petroleum Iron Works Co., Sharon, Pa.
J. B. Schofield's Sons Co., Macon, Ga.
Stanwood Corp., Cincinnati, Ohio
Superior Body Corp., Marion, Ind.
Vest. Mch. Co., Inc., Louisville, Ky.

BRACES, TRINCH

*Templeton, Kenly & Co., Chicago
Jas. H. Channon Mfg. Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Fisher & Hayes Rope & Steel Co., Chicago
Hawley Mfg. Co., Chicago
Kalamazoo Fdry. & Mach. Co., Kalamazoo, Mich.
Waldo Bros. & Bond Co., Boston

BRANDING TOOLS

Everhot Mfg. Co., Maywood, Ill.

BRASS GOODS

Glanzer Brass Mfg. Co., Cleveland, Ohio
Haydenville Co., Haydenville, Mass.
Hays Mfg. Co., Erie, Pa.
Mueller Company, Decatur, Ill.
Union Water Meter Co., Worcester, Mass.
United-Oberdorf Corp., Cleveland, Ohio

BREAKERS, CONCRETE

*Independent Pa. Tool Co., Chicago
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., N. Y.
Cleveland Rock Drill Co., Cleveland, Ohio
Gardner-Denver Co., Quincy, Ill.
Hardsong Wonder Drill Co., Ottumwa, Iowa
Ingersoll-Rand Co., New York
Milwaukee Gas Tool Co., Milwaukee
Rapid Concrete Breaker Co., Los Angeles, Cal.

BRICK, PAVING (See Paving Brick)

BRIDGE FLOORS

*Armco Culvert Mfrs. Assn., Middletown, O.

BRIDGES AND BUILDINGS, STEEL

*Blaw-Knox Co., Pittsburgh, Pa.
*Frederick Sauer Corporation, N. Y.
American Bridge Co., N. Y.
Bellevue Br. & Stl. Co., Bellefontaine, O.
Belmont Iron Works, Philadelphia
Berlin Constr. Co., Berlin, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Boston Bridge Works, Boston
Butler Mfg. Co., Minneapolis, Minn.
Central States Br. Co., Indianapolis, Ind.
Champion Bridge Co., Wilmington, Ohio
Chesapeake Iron Works, Baltimore, Md.
Clinton Bridge Works, Clinton, Iowa
Eastern Bridge & Struc. Co., Worcester, Mass.
Flour City Orn. Iron Co., Minneapolis
Fort Pitt Br. Works, Pittsburgh, Pa.
Hughes-Keehan Co., Mansfield, Ohio
Ingalls Iron Works Co., Birmingham, Ala.
Inter. Steel & Iron Co., Evansville, Ind.
Lakeside Br. & Stl. Co., No. Milwaukee
Louisville Br. & Iron Co., Louisville, Ky.
McClintic Marshall Co., Pittsburgh, Pa.
Milwaukee Br. Co., Milwaukee, Wis.
Minn. Stl. & Mch. Co., Minneapolis
Missouri V. Br. & Ir. Co., Leavenworth, Kan.
Mt. Vernon Br. Co., Mt. Vernon, Ohio
Penn Bridge Co., Beaver Falls, Pa.
Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa.
Richmond Struc. Stl. Co., Richmond, Va.
Riverside Br. Co., Martins Ferry, Ohio
Virginia Br. & Ir. Co., Roanoke, Va.
Wisc. Br. & Ir. Co., No. Milwaukee, Wis.

BROOMS (See Street Sweeping Brooms)

BUCKETS, AUTOMATIC DUMPING

*Lakewood Eng. Co., Cleveland, O.
*Union Iron Wks., Inc., Hoboken, N. J.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

BUCKETS, CLAM SHELL

*Blaw-Knox Co., Pittsburgh, Pa.
*Erie Steel Const. Co., Erie, Pa.
*Geo. Halsey Mfg. Co., N. Y.
*Hayward Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
*Lakewood Eng. Co., Cleveland, Ohio
*G. H. Williams Co., Erie, Pa.
Buffalo Hat & Der. Co., Buffalo, N. Y.
Browning Crane Co., Cleveland, Ohio
F. A. Coleman Co., Cleveland, Ohio
J. F. Kiesler Co., Chicago
Link-Belt Co., Chicago
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago
Owen Bucket Co., Cleveland, Ohio
Page Eng. Co., Chicago

BUCKETS, CONCRETE

*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mch. Co., Dunellen, N. J.
*Union Iron Works, Inc., Hoboken, N. J.
Norris K. Davis, San Francisco, Calif.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

BUCKETS, DRAGLINE

*Beaumont Mfg. Co., Philadelphia
*Blaw-Knox Co., Pittsburgh, Pa.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Hayward Co., New York
*Sauerman Bros., Chicago
*G. H. Williams Co., Erie, Pa.
Link-Belt Co., Chicago
Monaghan Mach. Co., Chicago
Page Eng. Co., Chicago
Pioneer Bucket Co., Indianapolis, Ind.
Russell Grader Mfg. Co., Minneapolis

BUCKETS, DREDGING AND EXCAVATING

*Blaw-Knox Co., Pittsburgh, Pa.
*Geo. Halsey Mfg. Co., N. Y.
*Hayward Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
*Lakewood Eng. Co., Cleveland, Ohio
*G. H. Williams Co., Erie, Pa.
Browning Crane Co., Cleveland
J. F. Kiesler Co., Chicago
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago
Owen Bucket Co., Cleveland, Ohio

BUCKETS, ORANGE PEEL

*Hayward Co., N. Y.
Industrial Works, Bay City, Mich.
J. F. Kiesler Co., Chicago
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago

BUILDING FORMS (See Forms, Conc.)

BUILDINGS, STEEL (See Bridges)

BULLDOZERS

*Trackson Co., Milwaukee, Wis.
Miami Trailer-Scraper Co.
LaPlant-Chasteau Mfg. Co., Cedar Rapids, Iowa

BUNKS AND COTS

Pt. Pitt Bedding Co., Pittsburgh, Pa.
Haggard & Marcellus Co., Chicago
Southern Rome Co., Baltimore, Md.

CABLES (See Wire and Cable)

CABLEWAYS, DRAGLINE

*Beaumont Mfg. Co., Philadelphia
*S. Flory Mfg. Co., Bangor, Pa.
*L. P. Green, Chicago
*Sauerman Bros., Chicago
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
Russell Grader Mfg. Co., Minneapolis
Street Bros. Mach. Works, Chattanooga

CARS FOR MOTOR TRUCKS

Highland Body Mfg. Co., Cincinnati, Ohio
Weatherproof Body Corp., Corvallis, Mich.

CAISSONS

American Bridge Co., N. Y.
Biggs Boller Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Foundation Co., N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
O'Rourke Eng. Constr. Co., N. Y.
Petroleum Ir. Wks. Co., Sharon, Pa.

CALCIUM CHLORIDE FOR ROADS

*Dow Chemical Co., Midland, Mich.
*Pittsburgh Plate Glass Co., Barberton, O.
*Solvay Sales Corp., New York

CANS FOR GARBAGE AND REFUSE

American Can Co., N. Y.
Economy Baler Co., Ann Arbor, Mich.
Rochester Can Co., Rochester, N. Y.
Solar-Sturges Mfg. Co., Melrose Pk., Ill.
Witt Cornice Co., Cincinnati, Ohio

CAR UNLOADERS (See Loaders)

CARS, INDUSTRIAL V. DUMPING

*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
Atlas Car & Mfg. Co., Cleveland, Ohio
Austin Mfg. Co., Chicago
Case Crane & Engg. Co., Columbus, O.
Chase Fdry. & Mfg. Co., Columbus, Ohio
Easton Car & Const. Co., Easton, Pa.
C. W. Hunt Co., W. New Brighton, N. Y.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

United Ir. Wks., Inc., Kansas City, Mo.
Weller Mfg. Co., Chicago
Whiting Corp., Harvey, Ill.

CARTS, CONCRETE

*General Wheelbarrow Co., Cleveland, Ohio
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*Ransome Conc. Mch. Co., Dunellen, N. J.
Acme Rd. Machy. Co., Frankfort, N. Y.
Case Crane & Engg. Co., Columbus, O.
Chattanooga Wheelbarrow Co., Chattanooga, Tenn.
Cleveland Wheelbarrow Co., Cleveland, Ohio
Easton Car & Const. Co., Easton, Pa.
E. D. Etnyre & Co., Oregon, Ill.
Gray Iron Fdry. Co., Reading, Pa.
Jackson Mfg. Co., Harrisburg, Pa.
Lee Trailer & Body Co., Plymouth, Ind.
Sterling Wheelbarrow Co., Milwaukee
Toledo Wheelbarrow Co., Toledo, Ohio

CAST IRON PIPE (See Pipe, Cast Iron)

CASTINGS, STEEL

*Brown Clutch Co., Sandusky, Ohio
*Cleveland Steel Tool Co., Cleveland
*Farrell-Cheser Steel Fdry. Co., Sandusky, Ohio
*G. H. Williams Co., Erie, Pa.
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

CASTINGS, STREET AND SEWER

*Armco Culvert Mfrs. Assn., Middletown, Ohio
*Central Fdry. Co., N. Y.
*U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J.
Canton Fdry. & Mach. Co., Canton, Ohio
H. W. Clark Co., Matteson, Ill.
J. B. Clow & Sons, Chicago
W. E. Dee Co., Chicago
Donley Bros. Co., Cleveland
Elkhart Fdry. & Mach. Co., Elkhart, Ind.
Gallon Iron Works & Mfg. Co., Galien, O.
Gilbert Mfg. Co., Aberdeen, S. Dak.
Hedges-Walsh-Weldner Co., Chattanooga
Klaner Mfg. Co., Dubuque, Iowa
Madison Fdry. Co., Cleveland, Ohio
Pechstein Iron Works, Keokuk, Iowa
Sessions Foundry Co., Bristol, Conn.
South Bend Fdry. Co., So. Bend, Ind.

CATCH BASINS (See Castings, Street)

CATCH BASIN CLEANING OUTFITS

Atlas Sales Corp., New York
Elgin Sales Corp., N. Y.
Mack Trucks, Inc., N. Y.

CAULKING MACHINERY AND TOOLS

*Independent Pa. Tool Co., Chicago
Cleveland Rock Drill Co., Cleveland, Ohio
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York
Mueller Company, Decatur, Ill.

CEMENT—(P. C. stands for Portland Cement)

*Pittsburgh Plate Glass Co., Barberton, Ohio
Acme Cement Corp., Catskill, N. Y.
Aetna P. C. Co., Detroit, Mich.
Allentown P. C. Co., Catsaunau, Pa.
Alpha P. C. Co., Easton, Pa.
Ash Grove Lime & P. C. Co., Kansas City, Mo.
Atlas P. C. Co., N. Y.
Beaver P. C. Co., Portland, Ore.
Bessemer Limestone & C. Co., Youngstown, O.
British Col. Cement Co., Victoria, B. C.
Canada Cement Co., Ltd., Montreal, Canada
Colorado P. C. Co., Denver, Colo.
Consolidated Cement Corp., Chicago
Cowell P. C. Co., Cowell, Cal.
Crescent P. C. Co., Wampum, Pa.
Dewey P. C. Co., Kansas City, Mo.
Diamond P. C. Co., Cleveland, Ohio
Edison P. C. Co., N. Y.
Georgia Cement & Stone Co., Birmingham, Ala.
Giant P. C. Co., Philadelphia, Pa.
Glens Falls P. C. Co., Glens Falls, N. Y.
Golden State P. C. Co., Los Angeles, Cal.
Great West'n P. C. Co., Kansas City, Mo.
Hawkeye P. C. Co., Des Moines, Iowa
Hercules Cement Corp., Philadelphia
Hermitage P. C. Co., Nashville, Tenn.
Huron P. C. Co., Detroit, Mich.
International Cement Corp., N. Y.
International P. C. Co., Ltd., Spokane, Wash.
Kosmos P. C. Co., Louisville, Ky.
La Tolteca Compania de Cemento Portland, Mexico City, Mex.
Lawrence Cement Co., New York
Lehigh P. C. Co., Allentown, Pa.
Louisville Cement Co., Louisville, Ky.
Manitowoc P. C. Co., Manitowoc, Wis.
Mariboro Cement Co., Edmonton, Can.
Marquette Cement Mfg. Co., Chicago
Missouri P. C. Co., St. Louis, Mo.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*



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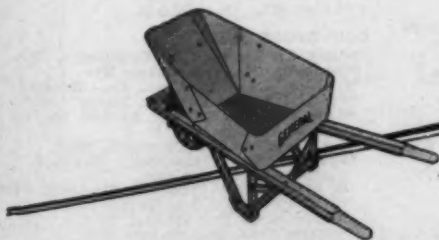
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Company Name

Street Address

City, State

Where to Purchase

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Monarch Cement Co., Humboldt, Kans.
Monolith P. C. Co., Los Angeles, Cal.
National Cement Co., Birmingham, Ala.
Nasareth Cement Co., Nasareth, Pa.
Nebraska Cement Co., Denver, Colo.
Newago P. C. Co., Newago, Mich.
New Egyptian P. C. Co., Detroit
North Amer. Cement Corp., Albany, N. Y.
Northwestern States P. C. Co., Mason City, Ia.
Oklahoma P. C. Co., Denver
Olympic P. C. Co., Ltd., Seattle
Oregon P. C. Co., Portland, Ore.
Pacific P. C. Co., San Francisco
Peerless P. C. Co., Detroit, Mich.
Peninsular P. C. Co., Cement City, Mich.
Penn-Allen Cement Co., Nasareth, Pa.
Pennsylvania-Dixie Cement Corp., N. Y.
Petoskey P. C. Co., Petoskey, Mich.
Phoenix P. C. Co., Philadelphia
P. C. Co. of Utah, Salt Lake City
Pyramid P. C. Co., Des Moines
Riverside P. C. Co., Los Angeles
St. Marys Cement Co., Toronto, Can.
San Antonio P. C. Co., San Antonio
Sandusky Cement Co., Cleveland, Ohio
Santa Cruz P. C. Co., San Francisco
Signal Mountain P. C. Co., Chattanooga, Tenn.
Southern States P. C. Co., Rockport, Ga.
Southwest P. C. Co., Los Angeles, Cal.
Standard P. C. Co., Cleveland
Standard P. C. Co., Cleveland
Sun P. C. Co., Portland, Ore.
Superior P. C. Co., Seattle, Wash.
Three Forks P. C. Co., Denver, Colo.
Tidewater P. C. Co., Baltimore, Md.
Trinity P. C. Co., Dallas, Tex.
Union P. C. Co., Denver, Colo.
U. S. P. C. Co., Denver, Colo.
Universal P. C. Co., Chicago
Utah Idaho Cement Co., Ogden, Utah
Vulcanite P. C. Co., Philadelphia
Wabash P. C. Co., Detroit
Warrior Cement Corp., Ghatta, Tenn.
Wellston Iron Furnace Co., Jackson, Ohio
Wolverine P. C. Co., Coldwater, Mich.
Wyandotte P. C. Co., Detroit

CEMENT BLOCK MACHINES

*Cement Block Machy. Co., Newark, N. J.
Abrams Cement Tool Co., Detroit, Mich.
Zagelmeyer Cast Stone Block Machy. Co., Bay City, Mich.

CEMENT GUNS

Cement-Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories)

CEMENT TOOLS

Abrams Cement Tool Co., Detroit

CENTRIFUGAL PUMPS (See Pumps, Centrifugal)

CHAINS

*Chain Belt Co., Milwaukee, Wis.
Amer. Chain Co., Inc., Bridgeport, Conn.
Columbus McKinnon Chain Co., Columbus, O.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
U. S. Chain & Forge Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CHIMNEYS, CONCRETE

Heine Chimney Co., Chicago
Rust Engineering Co., Pittsburgh, Pa.
Weber Chimney Co., Chicago

CHIMNEYS, RADIAL BRICK

Amer. Chimney Corp., N. Y.
Continental Chimney Co. of Chicago, Chicago
Alphons Custodis Chimney Const. Co., N. Y.
Heine Chimney Co., Chicago
H. R. Heinicke, Inc., Indianapolis, Ind.
M. W. Kellogg & Co., N. Y.
Rust Eng. Co., Pittsburgh, Pa.

CHIMNEYS, STEEL (See Stacks, Steel)

CHISELS, CHIPPING

*Cleveland Steel Tool Co., Cleveland, Ohio

CHLORINATORS

*Wallace & Tiernan Co., Inc., Newark, N. J.
Norwood Engr. Co., Florence, Mass.
Paradon Eng. Co., Arlington, N. J.

CHLORINE, LIQUID

(See Liquid Chlorine)

CHUTES, CONCRETE

*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Const. Mch. Co., Dunellen, N. J.

CLAMPS & TIES, FORM

*Insley Mfg. Co., Indianapolis
Batavia Clamp Co., Inc., Batavia, N. Y.
Concrete Form-Hold Co., Inc., Culver City, Cal.
Concrete Form Tie Corp., Pittsburgh, Pa.
Eay-Set Wall Tie Co., Dayton, O.
W. A. Kuhlman & Co., Toledo
M. & M. Wire Clamp Co., Minneapolis
James L. Taylor Mfg. Co., Poughkeepsie, N. Y.

CLAMPS, COLUMN

*Ellis & Ford Mfg. Co., Detroit, Mich.
*Insley Mfg. Co., Indianapolis, Ind.
Black Bros. Co., Mendota, Ill.
Concrete Eng. Co., Omaha, Neb.
Handy Mfg. Co., Chicago
Kardong Bros., Inc., Minneapolis
W. A. Kuhlman & Co., Toledo, Ohio
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
J. E. Porter Corp., Ottawa, Ill.
H. W. Roes Co., Cincinnati
Steelform Contracting Co., San Francisco
Sterling Wheelbarrow Co., Milwaukee
Symons Clamp & Mfg. Co., Chicago
James L. Taylor Mfg. Co., Poughkeepsie, N. Y.
Universal Form Clamp Co., Chicago

CLAY DIGGERS, PNEUMATIC

*Independent Pne. Tool Co., Chicago
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., New York

CLAY PIPE

(See Pipe, Vitrified Clay)

CLIPS, WIRE ROPE

*Amer. Steel & Wire Co., Chicago
Amer. Hoist & Derrick Co., St. Paul, Minn.
Fischer & Hayes Rope & Steel Co., Chicago
Hazard Wire Rope Co., Wilkesbarre, Pa.
Thos. Laughlin Co., Portland, Me.
Marion Malleable Iron Works, Marion, Ind.
C. M. Mockbee & Co., Cincinnati, Ohio
John A. Roebeling Sons Co., Trenton, N. J.
Upson-Walton Co., Cleveland, Ohio

CLUTCHES

*Brown Clutch Co., Sandusky, Ohio
*Twin Disc Clutch Co., Racine, Wis.
*Waukesha Motor Co., Waukesha, Wis.
Brown-Lipe Gear Co., Syracuse, N. Y.
Link-Belt Co., Chicago

COCKS, CURE AND CORPORATION

Chapman Valve Mfg. Co., Indian Orchard, Mass.
Glauber Brass Mfg. Co., Cleveland, Ohio
Haydenville Co., Haydenville, Mass.
Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
Union Wtr. Mtr. Co., Worcester, Mass.

COMPRESSORS, AIR (See Air Compressors)

CONCRETE BLOCK MACHINES (See Cement Block Machines)

CONCRETE CURING

*Barber Asphalt Co., Philadelphia
*Dow Chemical Co., Midland, Mich.
*McEverlast, Inc., Los Angeles, Calif.
*Pittsburgh Plate Glass Co., Barberton, Ohio
*Selvay Sales Corp., New York

CONCRETE HEATERS

*Chassee Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
*Alex. Milburn Co., Baltimore, Md.
Aeroll Burner Co., West New York, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati

CONCRETE MIXERS

*Amer. Cem. Mch. Co., Inc., Keokuk, Iowa
*Atlas Engineering Co., Clintonville, Wis.
*Chain Belt Co., Milwaukee, Wis.
*Construction Mch. Co., Waterloo, Iowa
*Jaeger Mach. Co., Columbus, Ohio
*Keckring Co., Milwaukee, Wis.
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*John Lauson Mfg. Co., New Holstein, Wis.
*Ransome Const. Mch. Co., Dunellen, N. J.
Acme Rd. Machy. Co., Frankfort, N. Y.
Anchor Mfg. Co., Chicago
Archer Iron Works, Chicago
Badger Con. Mixer Co., Milwaukee
Norris K. Davis, San Francisco, Calif.
J. B. Foote Fdry. Co., Fredericktown, Ohio
Gray Iron Fdry. Co., Reading, Pa.
Judy Mfg. Co., Centerville, Iowa
Knickerbocker Co., Jackson, Mich.
Kwik-Mix Concrete Mixer Co., Port Washington, Wis.
Leach Co., Oshkosh, Wis.
Mixermobile Co., Milwaukee
Orr & Sembower, Reading, Pa.
Remmel Mfg. Co., Keokuk, Wis.

Republic Iron Works, Tecumseh, Mich.
T. L. Smith Co., Milwaukee

CONCRETE PAVERS (See Pavers, Concrete)

CONCRETE PILING (See Piling)

CONCRETE PIPE (See Pipe, Concrete)

CONCRETE REINFORCEMENT

*American Steel & Wire Co., Chicago
*Truscon Steel Co., Youngstown, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Concrete Steel Co., N. Y.
Consolidated Exp. Metal Co., Wheeling, W. Va.
Electric Welding Co., Pittsburgh, Pa.
Ft. Pitt Bridge Works, Pittsburgh, Pa.
Genfre Steel Co., Youngstown, Ohio
Inland Steel Co., Chicago
Kalm Steel Co., Chicago
Laclede Steel Co., St. Louis, Mo.
National Steel Fabric Co., Pittsburgh
Republic Iron & Steel Co., Youngstown, Ohio
J. T. Ryerson & Son, Chicago
Wickwire-Spencer Steel Co., N. Y.
Youngstown Pressed Steel Co., Warren, Ohio

CONCRETE ROAD FINISHERS

*Blaw-Knox Co., Pittsburgh, Pa.
*A. W. French & Co., Chicago
*Heitzel Steel Form & Iron Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio

CONDENSERS

Allis-Chalmers Mfg. Co., Milwaukee
Ingersoll-Rand Co., N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wheeler Cond. & Eng. Co., Carteret, N. J.
Worthington Pump & Machy. Corp., N. Y.

CONDUIT RODS

F. Bissell Co., Toledo, Ohio
Turbine Sewer Mch. Co., Milwaukee
Waldo Bros. & Bond Co., Boston

CONDUITS, UNDERGROUND

Amer. Vitr. Products Co., Akron, Ohio
Johns-Manville, Inc., N. Y.
National Fireproofing Co., N. Y.
Rie-wil Co., Cleveland

CONTRACTORS' EQUIPMENT DEALERS (See Pages 99 to 132)

CONVEYORS, BELT

*Atlas Engineering Co., Clintonville, Wis.
*Austin-Western Ed. Mch. Co., Chicago
*Barber-Greene Co., Aurora, Ill.
*The Burch Corp., Crestline, Ohio
*Chain Belt Co., Milwaukee, Wis.
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., New York
*Fairfield Engineering Co., Marion, Ohio
*Good Rds. Mch. Co., Kennett Sq., Pa.
*Geo. Hais Mfg. Co., N. Y.
*Jos. Honhorst Co., Cincinnati
*Industrial Brownhoist Corp., Cleveland
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland
Gallon Iron Works & Mfg. Co., Gallon, Ohio
Gifford Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
New Holland Mch. Co., N. Holland, Pa.
Northern Conveyor Co., Janesville, Wis.
Samuel Olson & Co., Chicago
Portable Machinery Co., Olifton, N. J.
Robins Conv. Belt Co., N. Y.
Russell Grader Mfg. Co., Minneapolis
Jas. B. Seaverns Co., Batavia, Ill.
Smith Eng. Wks., Milwaukee
Standard Conv. Co., No. St. Paul, Minn.
Stephens-Adamsen Mfg. Co., Aurora, Ill.
Universal Crusher Co., Cedar Rapids, Iowa
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CONVEYORS, BUCKET

*Atlas Engineering Co., Clintonville, Wis.
*Chain Belt Co., Milwaukee, Wis.
*Chicago Automatic Conv. Co., Chicago
*Fairfield Engineering Co., Marion, Ohio
*Good Roads Machy. Co., Kennett Sq., Pa.
*Geo. Hais Mfg. Co., N. Y.
*Jos. Honhorst Co., Cincinnati, Ohio
*Industrial Brownhoist Corp., Cleveland
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, Ohio
H. W. Caldwell & Son, Chicago
Gifford Wood Co., Hudson, N. Y.
Godfrey Conv. Co., Elkhart, Ind.
Guarantee Constn. Co., N. Y.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
New Holland Mach. Co., N. Holland, Pa.
Samuel Olson & Co., Chicago
Republic Rubber Co., Youngstown, Ohio
Robins Conv. Belt Co., N. Y.
Russell Grader Mfg. Co., Minneapolis
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Stephens Adamson Mfg. Co., Aurora, Ill.
Universal Crusher Co., Cedar Rapids, Iowa
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CONVEYORS, GRAVITY

Lamson Co., Syracuse, N. Y.
Logan Co., Louisville, Ky.
Mathews Conveyor Co., Elwood City, Pa.
Standard Conv. Co., No. St. Paul, Minn.

COUPLINGS, ROSE

Cleveland Pneum. Tool Co., Cleveland, Ohio
Gliman Mfg. Co., East Boston, Mass.
Ingersoll-Rand Co., N. Y.
W. H. Keller, Inc., Grand Haven, Mich.
Malconroy Co., Philadelphia

CRANES, CRAWLER

*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Manitowoc Engr. Works, Manitowoc, Wis.
*Osagood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
*Universal Crane Co., Lorain, Ohio
Austin Machy. Corp., Muskegon, Mich.
Byers Mach. Corp., Muskegon, Mich.
General Excavator Co., Marion, Ohio
Link-Belt Co., Chicago
McMyler Interstate Co., Cleveland
Mead-Morrison Mfg. Co., Boston
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Star Drilling Mach. Co., Akron, Ohio

CRANES, LOCOMOTIVE

*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Koebling Co., Milwaukee
*Manitowoc Engr. Works, Manitowoc, Wis.
*Osagood Company, Marion, Ohio
*Parsons Co., Newton, Iowa
*Thew Shovel Co., Lorain, Ohio
Amer. Hat. & Derrick Co., St. Paul, Minn.
Browning Crane Co., Cleveland, Ohio
Davenport Loc. Works, Davenport, Iowa
Link-Belt Co., Chicago
Loc. Crane Co. of Amer., Champaign, Ill.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Northwest Eng. Works, Chicago
Ohio Loc. Crane Co., Bucyrus, Ohio
Orton Crane & Shovel Co., Chicago
Jas. B. Seaverns Co., Batavia, Ill.
Speeder Mch. Corp., Cedar Rapids, Iowa
U. S. Crane Co., Chicago

CRANES, ONE-TON

*Whitehead & Kales Co., Detroit, Mich.
Hughes-Keenan Co., Mansfield, Ohio
Otis Eng. Co., New York
Sterling Tractor Equipment Co., New York

CRANES, OVERHEAD TRAVELING

*Erie Steel Const'n. Co., Erie, Pa.
Alliance Mach. Co., Alliance, O.
Chesapeake Iron Wks., Baltimore, Md.
Chisholm-Moore Mfg. Co., Cleveland
Curtis Pa. Mch. Co., St. Louis
Harnischfeger Corp., Milwaukee, Wis.
Milwaukee Elec. Crane Co., Milwaukee
Morgan Eng. Co., Alliance, O.
Northern Eng. Wks., Detroit, Mich.
Shaw Crane Wks., Muskegon, Mich.
Shepard Elec. Cr. & Hst. Co., Montour Falls, N. Y.
Toledo Crane Co., Bucyrus, O.
Whiting Fdry. & Equip. Co., Harvey, Ill.

CRANES, TRUCK

*Universal Crane Co., Lorain, Ohio
Atlas Sales Corp., New York
Bay City Fdry. & Mach. Co., Bay City, Mich.
Browning Crane Co., Cleveland
Byers Mach. Co., Ravenna, O.
Erted Mfg. Co., Portland, Ore.
Orton Crane & Shovel Co., Chicago
Harnischfeger Corp., Milwaukee, Wis.

CRANES, WRECKING

*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
Industrial Wks., Bay City, Mich.

CRAWLER ATTACHMENTS

*Geo. Haler Mfg. Co., N. Y.
*Trackson Co., Milwaukee, Wis.
Belle City Mfg. Co., Racine, Wis.
Link-Belt Co., Chicago

CREEPER WHEELS

*Creeper Wheel Co., Reading, Pa.

CROSBY BLOCKS, TIMBER, ETC.

Amer. Cross. Co., Inc., Louisville, Ky.
Amer. Cross. Wks., Inc., New Orleans, La.
Ayer & Lord Tie Co., Chicago
Carier Bloxoland Flooring Co., K. City, Mo.

Colonial Crs. Co., Inc., Louisville, Ky.
Compressed Wood Preserv. Co., Cincinnati, O.
Cres. Materials Co., New Orleans, La.
Georgia Cresos. Co., Louisville, Ky.
Jennison-Wright Co., Toledo, O.
Long Bell Lumber Co., Kansas City, Mo.
Midland Cresos. Co., Granite City, Ill.
Pensacola Cresoating Co., Pensacola, Fla.
Republic Cresos. Co., Indianapolis, Ind.
Southern Wood Pres. Co., Atlanta, Ga.
Wyckoff Pipe & Cresos. Co., N. Y.

CRUSHERS, ROCK

*Austin-Western Rd. Mach. Co., Chicago
*Good Rds. Machy. Co., Kennett Sq., Pa.
Acme Rd. Machy. Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Gallon Jr. Wks. & Mfg. Co., Gallon, O.
New Eng. Road Machy. Co., So. Boston, Mass.
New Holland Mach. Co., New Holland, Pa.
Russell Grader Mfg. Co., Minneapolis
Smith Eng. Wks., Milwaukee
Sturtevant Mill Co., Boston
Universal Crusher Co., Cedar Rapids, Ia.
Universal Rd. Mch. Co., Kingston, N. Y.
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

CULVERTS, CAST IRON

*U. S. C. I. Pipe & Fdry. Co., Burlington, N. J.
American Casting Co., Birmingham, Ala.
Amer. C. I. Pipe Co., Birmingham, Ala.
Beach Mfg. Co., Charlotte, Mich.
Gallon Iron Wks. & Mfg. Co., Gallon, O.
Gilbert Mfg. Co., Aberdeen, S. D.
R. D. Wood & Co., Philadelphia

CULVERTS, CORRUGATED METAL

*Armco Culvert Mfrs. Assn., Middletown, O.
*Austin-Western Rd. Mach. Co., Chicago
*Good Rds. Machy. Co., Kennett Sq., Pa.
American Casting Co., Birmingham, Ala.
Austin Mfg. Co., Chicago
Bark River Bridge & Culv. Co., Bark River, Mich.
Beach Mfg. Co., Charlotte, Mich.
Beatrice Steel Tank Mfg. Co., Beatrice, Neb.
Berger Mfg. Co., Jacksonville, Fla.
Boardman Co., Okla. City, Okla.
Burnham Mfg. Co., Woods Cross, Utah
Calif. Corr. Culv. Co., W. Berkeley, Cal.
Canada Ingot Ir. Co., Ltd., Guelph, Ont.
Canton Culv. & Silo Co., Canton, O.
Corr. Culv. Co., Moberly, Mo.
Decatur Corrials & Roofing Co., Albany, Ala.
Dixie Culv. & Metal Co., Atlanta, Ga.
Dixie Culv. Mfg. Co., Little Rock, Ark.
Edwards Mfg. Co., Cincinnati
Gallon Iron Wks. & Mfg. Co., Gallon, O.
Gilbert Mfg. Co., Aberdeen, S. D.
H. Hardesty Mfg. Co., Denver, Colo.
Highway Prod. & Mfg. Co., Elmhurst, N. Y.
Ind. Corr. Culv. Co., Mason City, Ia.
Iowa Pure Ir. Co., Des Moines, Ia.
Kentucky Culvert Mfg. Co., Louisville, Ky.
Klauer Mfg. Co., Dubuque, Ia.
Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
Md. Culv. & Metal Co., Baltimore
N. E. Metal Culv. Co., Palmer, Mass.
Nebraska Culv. & Mfg. Co., Wahoo, Neb.
New England Metal Culvert Co., Nashua, N. H.
Newport Culvert Co., Newport, Ky.
Northfield Ir. Co., Northfield, Minn.
Northwest's Sheet & Ir. Wks., Wapeton, N.D.
Ohio Corr. Culv. Co., Middletown, O.
W. Q. O'Neill Co., Crawfordsville, Ind.
Pure Iron Culvert & Mfg. Co., Portland, Ore.
Road Supply & Metal Co., Topeka, Kan.
St. Paul Corr. Co., St. Paul, Minn.
Sioux Falls Metal Culv. Co., Sioux Falls, S. D.
So. Metal Culv. Co., Salisbury, N. C.
Spokane Culv. & Tank Co., Spokane, Wash.
Tenn. Metal Culv. Co., Nashville
U. S. Dr. & Culv. Co., Bay City, Mich.
Virginia Culvert Corp., Roanoke, Va.
Western Metal Mfg. Co., Houston, Tex.
Wheeling Corr. Co., Wheeling, W. Va.
Wyatt Metal & Bldg. Wks., Dallas, Tex.

CULVERT FORMS

*Blaw-Knox Company, Pittsburgh, Pa.
*Helsel Steel Form & Iron Co., Warren, O.
Concrete Form Co., Inc., Syracuse, N. Y.
Northfield Iron Co., Northfield, Minn.

CURE BOXES

H. W. Clark Co., Mattoon, Ill.
J. B. Clow & Sons, Chicago
Columbian Iron Wks., Chattanooga, Tenn.
Hedgoc-Walsh-Walder Co., Chattanooga, Tenn.
Madison Fdry. Co., Cleveland, O.
Mueller Co., Decatur, Ill.
J. S. Schofield's Sons Co., Macon, Ga.
R. D. Wood & Co., Philadelphia, Pa.

CURE, GUTTER AND BASE FORMS (See Forms, Concrete)

CURE GUARDS, STEEL

W. S. Godwin Co., Baltimore

CURE, STEEL PROTECTED

*Truscon Steel Co., Youngstown, O.
Concrete Steel Co., N. Y.

CURING OF CONCRETE

*Barber Asphalt Co., Philadelphia
*Dow Chemical Co., Midland, Mich.
*McEverlast, Inc., Los Angeles, Calif.
*Pittsburgh Plate Glass Co., Warburton, Ohio
*Solway Sales Corp., N. Y.

CUTTERS, PIPE, HAND

*Ellis & Ford Mfg. Co., Detroit
Armstrong Mfg. Co., Bridgeport, Ct.
Barnes Tool Co., New Haven, Ct.
Erie Tool Works, Erie, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Oswego Tool Co., Oswego, N. Y.
Reed Mfg. Co., Erie, Pa.
Walworth Mfg. Co., Boston

CUTTERS, ROD AND WIRE

*Koebling Co., Milwaukee, Wis.
*Morse-Starrett Prod. Co., Oakland, Calif.
Buffalo Forge Co., Buffalo, N. Y.
Carroll Mfg. Co., Sterling, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Helwig Mfg. Co., St. Paul, Minn.
M. & M. Wire Clamp Co., Minneapolis
Worthington Pump & Mch. Corp., N. Y.

CUTTING EDGES

*General Wheelbarrow Co., Cleveland
J. D. Adams & Co., Indianapolis, Ind.
Russell Grader Mfg. Co., Minneapolis
Shank Mfg. Co., Bucyrus, O.

CUTTING AND WELDING APPARATUS (See Welding Apparatus)

CYLINDER HEADS, RICARDO

*Waukesha Motor Co., Waukesha, Wis.

DERRICKS, GUY AND STIFF-LEG

*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N.Y.
*S. Flory Mfg. Co., Bangor, Pa.
*Inaley Mfg. Co., Indianapolis, Ind.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Htg. Engine Co., Newark, N. J.
*Saagen Derrick Co., Chicago
Amer. Hat. & Derrick Co., St. Paul, Minn.
John T. Horton Co., N. Y.
Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
National Htg. Eng. Co., Harrison, N. J.
Street Bros. Mach. Wks., Chattanooga
Superior Iron Wks., Superior, Wis.
Universal Htg. Machy. Corp., Buffalo

DERRICKS, PIPE LAYING

*Dobbie Fdry. & Mach. Co., Niagara Falls
*Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DERRICKS, REVOLVING

*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
Street Bros. Mach. Wks., Chattanooga

DERRICKS, STEEL

*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Hayward Co., N. Y.
*Inaley Mfg. Co., Indianapolis, Ind.
Amer. Hat. & Derrick Co., St. Paul
Street Bros. Mach. Wks., Chattanooga
Taylor Port. St. Derrick Co., Chicago

DERRICKS, STEEL PORTABLE

*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Lidgerwood Mfg. Co., Elizabeth, N. J.
Amer. Hat. & Derrick Co., St. Paul
Street Bros. Mach. Wks., Chattanooga

DERRICK FITTINGS

*S. Flory Mfg. Co., Bangor, Pa.
*Hayward Co., N. Y.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Htg. Engine Co., Newark, N. J.
Amer. Hat. & Derrick Co., St. Paul
Street Bros. Mach. Wks., Chattanooga

DIAPHRAGM PUMPING OUTFITS

*C. H. & E. Mfg. Co., Milwaukee, Wis.
*John Lauson Mfg. Co., New Holstein, Wis.

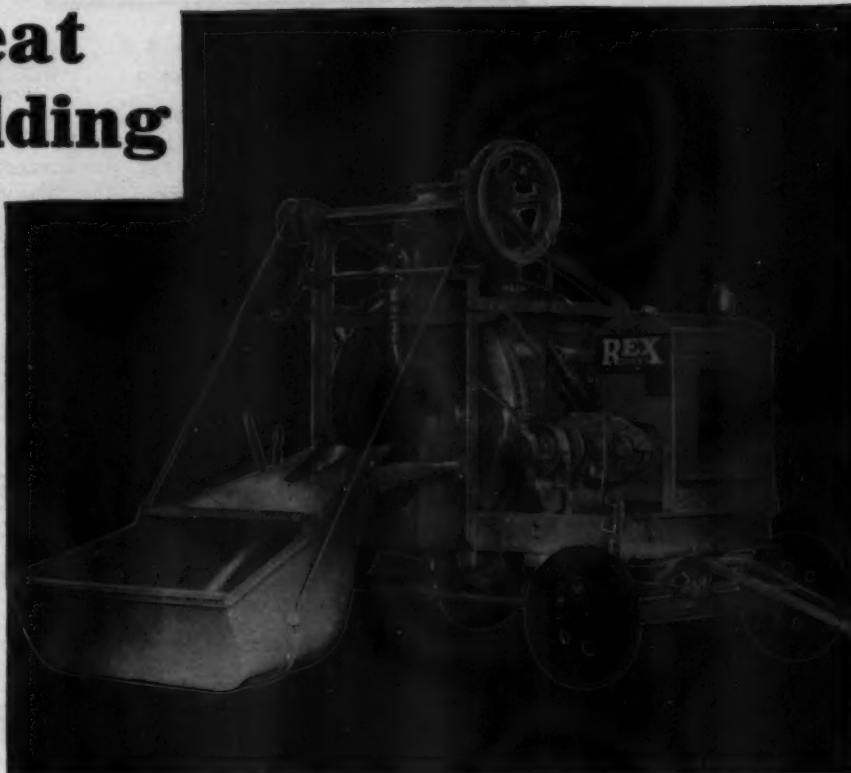
DIESEL ENGINES (See Engines, Oil)

DISTRIBUTORS, TAR AND ASPHALT

*Good Roads Machinery Co., Kennett Sq., Pa.
E. D. Etnyre & Co., Oregon, Ill.
Kinney Mfg. Co., Boston
Municipal Supply Co., So. Bend, Ind.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

Two Great New Building Mixers That



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- Gone are old-fashioned, easily frozen drum rollers—
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<input type="checkbox"/> 1/2-to 1-bag 5-S	<input type="checkbox"/> 6-bag 28-S
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<input type="checkbox"/> 1-to 2-bag 10-S	<input type="checkbox"/> 27-E Paver

Name _____
Address _____
City _____ State _____

Where to Purchase

DISTRIBUTING PLANTS, CONCRETE

- *Inley Mfg. Co., Indianapolis, Ind.
- *Lakewood Eng. Co., Cleveland, O.
- *Mansonia Const. Mch. Co., Dunellen, N. J.

DITCHING MACHINES (See Excavators)

DOORS AND SHUTTERS, STEEL ROLLING

- Cornell Iron Wks., L. I. City, N. Y.
- Edwards Mfg. Co., Cincinnati, Ohio
- Holzer Sheet Metal Works, New Orleans, La.
- Klannear Mfg. Co., Columbus, O.
- James Peters & Son, Philadelphia
- St. Paul Corrugating Co., St. Paul, Minn.
- Variety Rolling Door Co., Westerville, O.
- J. G. Wilson Corp., N. Y.

DRAGS, ROAD

- *Austin-Western Road Machinery Co., Chicago
- *Caterpillar Tractor Co., San Leandro, Calif.
- *General Wheelbarrow Co., Cleveland
- *Good Roads Machy. Co., Kennett Square, Pa.
- Acme Road Machy. Co., Frankfort, N. Y.
- J. D. Adams & Co., Indianapolis, Ind.
- American Steel Scraper Co., Sidney, Ohio
- Beach Mfg. Co., Charlotte, Mich.
- C. D. Edwards Mfg. Co., Albert Lea, Minn.
- Gallion Iron Works & Mfg. Co., Gallion, O.
- Miskin Scraper Wks., Ucon, Ia.
- Slusser-McLean Scraper Co., Sidney, Ohio
- Stockland Road Machinery Co., Minneapolis
- Western Wheeled Scraper Co., Aurora, Ill.

DRAWING INKS

- *Pelican Works, Gauthier Wagner, New York
- O. M. Higgins & Co., Brooklyn, N. Y.

DREDGES

- *Bay City Shovels, Inc., Bay City, Mich.
- *Bucyrus-Erie Co., Erie, Pa.
- *Hayward Co., N. Y.
- *Osgeod Company, Marion, Ohio
- Amer. Steel Dredge Co., Ft. Wayne, Ind.
- Ellicott Machy. Corp., Baltimore
- Marion Steam Shovel Co., Marion, O.
- Orton Crane & Shovel Co., Chicago
- J. S. Schofield's Sons Co., Macon, Ga.
- Stockton Iron Wks., Stockton, Cal.
- Street Bros. Mach. Wks., Chattanooga
- Superior Iron Wks., Superior, Wis.

DREDGES DIPPER

- *Bay City Shovels, Inc., Bay City, Mich.
- *Bucyrus-Erie Co., Erie, Pa.
- *Osgeod Company, Marion, Ohio
- Amer. Steel Dredge Co., Ft. Wayne, Ind.
- Link-Belt Co., Chicago
- Marion Steam Shovel Co., Marion, O.

DREDGES, HYDRAULIC

- *Bucyrus-Erie Co., Erie, Pa.
- Ellicott Mach. Corp., Baltimore
- Marion Steam Shovel Co., Marion, O.
- Morris Mach. Wks., Baldwinville, N. Y.

DREDGING MACHINERY

- *S. Flory Mfg. Co., Bangor, Pa.
- *Lidgerwood Mfg. Co., Elizabeth, N. J.
- *J. S. Mandy Htg. Engine Co., Newark, N. J.
- Street Bros. Mach. Wks., Chattanooga

DRILL STEEL SHARPENERS (See Sharpeners)

DRILLS, CORE

- *McKiernan-Terry Drill Co., N. Y.
- *Sanderson-Cyclone Drill Co., Orrville, O.
- *Sullivan Machy. Co., Chicago
- Ingersoll-Rand Co., N. Y.

DRILLS, ROCK

- *The Buhl Company, Chicago
- *Sanderson-Cyclone Drill Co., Orrville, O.
- *Sullivan Machy. Co., Chicago
- Chicago Pneumatic Tool Co., New York
- Cleveland Pneum. Tool Co., Cleveland, O.
- Cleveland Rock Drill Co., Cleveland, O.
- Dalzell Co., Philadelphia
- Gardner-Denver Co., Quincy, Ill.
- Gilman Mfg. Co., E. Boston
- Hardcock Wonder Drill Co., Ottumwa, Ia.
- Helwig Mfg. Co., St. Paul, Minn.
- Ingersoll-Rand Co., New York
- W. H. Keller, Inc., Grand Haven, Mich.
- Wood Drill Wks., Paterson, N. J.

DRILLS FOR WELLS AND BLAST HOLES (See Well Drilling Machy.)

DRUMS, HOLDING

- *Blaw-Knox Co., Pittsburgh, Pa.
- *Olyde Ir. Wks. Sales Co., Duluth, Minn.
- *Dobbie Fdry. & Mach. Co., Niagara Falls
- *Hayward Co., New York
- *Holtzel Steel Form & Ir. Co., Warren, O.
- Street Bros. Mach. Wks., Chattanooga

DRYERS, ASPHALT AND CEMENT

- Allis-Chalmers Mfg. Co., Milwaukee
- Amer. Blower Co., Detroit, Mich.
- Atlas Dryer Co., Cleveland, O.
- C. O. Bartlett & Snow Co., Cleveland, O.
- F. D. Cammer & Son Co., Cleveland, O.
- Lancaster Iron Works, Inc., Lancaster, Pa.
- Ruggles-Collea Engineering Co., New York

DRYERS, SAND AND GRAVEL

- *Chascoe Oil Burner Co., Elkhart, Ind.
- *Fos. Henshot Co., Cincinnati, O.
- *Alex. Milburn Co., Baltimore, Md.

- Aeroll Burner Co., West New York, N. J.
- American Process Co., New York
- C. O. Bartlett & Snow Co., Cleveland, O.
- Chase & Lyman, Boston
- Littleford Bros., Cincinnati, O.

DUMP BODIES FOR CONCRETE

- Easton Car & Const. Co., Easton, Pa.
- Lee Trailer & Body Co., Plymouth, Ind.

DUMP BODIES FOR MOTOR TRUCKS

- *Columbian St. Tank Co., Kansas City, Mo.
- *Highway Trailer Co., Edgerton, Wis.
- *Wood Hydr. Hoist & Body Co., Detroit
- Amer. Prod. & Trad. Co., Chicago
- Am. Truck & Body Co., Martinsville, Va.
- Anthony Co., Streator, Ill.
- Atlas Sales Corp., New York
- Columbia Body Corp., Columbia, Pa.
- Detroit Trailer & Mach. Co., Detroit
- Detweiler Mfg. Co., Gallion, O.
- Eagle Wagon Wks., Auburn, N. Y.
- Easton Car & Const. Co., Easton, Pa.
- Gallen All Steel Body Co., Gallion, O.
- Griscom-Russell Co., N. Y.
- Hell Co., Milwaukee
- Herr Dump Car Mfg. Co., Coatesville, Pa.
- Hughes-Keehan Co., Mansfield, O.
- The Hug Co., Highland, Ill.
- Jennings Aut. Dump Body, Roanoke, Va.
- Lee Trailer & Body Co., Plymouth, Ind.
- Mack Trucks, Inc., N. Y.
- Mandt Body Co., Keokuk, Ia.
- Marion Steel Body Co., Marion, O.
- Martin-Farry Corp., York, Pa.
- N. Y. Central Ir. Wks., Hagerstown, Md.
- Pechstein Iron Wks., Keokuk, Ia.
- Stewart Iron Wks. Co., Cincinnati
- Van Dorn Iron Wks. Co., Cleveland, O.

DUMP CARTS AND WAGONS, HORSE

- *Austin-Western Road Machy. Co., Chicago
- *Highway Trailer Co., Edgerton, Wis.
- Acme Road Machy. Co., Frankfort, N. Y.
- Acme Wagon Co., Emigsville, Pa.
- J. D. Adams & Co., Indianapolis
- Austin Mfg. Co., Chicago
- Bain Wagon Co., Kenosha, Wis.
- Columbia Body Corp., Columbia, Pa.
- Eagle Wagon Wks., Auburn, N. Y.
- Gilbert Mfg. Co., Aberdeen, S. D.
- G. H. Holabog & Bro., Jeffersonville, Ind.
- LaPlant-Chaste Mfg. Co., Cedar Rapids, Iowa
- Little Red Wagon Co., Omaha, Neb.
- Luedinghaus-Espenchied Wagon Co., St. Louis
- Russell Grader Mfg. Co., Minneapolis
- Smith Trailer Co., Syracuse, N. Y.
- Stockland Road Machinery Co., Minneapolis
- Streich Bros., Oakbrook, Wis.
- Western Wheeled Scraper Co., Aurora, Ill.

DUMP WAGONS (ALL STEEL), TRACTOR

- *Euclid Crane & Hoist Co., Euclid, O.
- LaPlant-Chaste Mfg. Co., Cedar Rapids, Iowa
- Smith Trailer Co., Syracuse, N. Y.
- Trail-IT Co., St. Paul, Minn.

DYNAMITE (See Explosives)

EARTH BORING EQUIPMENT

- *Highway Trailer Co., Edgerton, Wis.

EJECTORS, SEWAGE (See Sewage Ejectors)

ELECTRIC GENERATORS AND MOTORS

- American Motors Co., Cedarburg, Wis.
- The Louis Allis Co., Milwaukee
- Allis-Chalmers Mfg. Co., Milwaukee
- Crocker-Wheeler Co., Ampere, N. J.
- Fairbanks, Morse & Co., Chicago
- General Electric Co., Schenectady, N. Y.
- Graybar Electric Co., New York
- Ideal Electric & Mfg. Co., Mansfield, O.
- Lincoln Electric Co., Cleveland, O.
- Northwestern Mfg. Co., Milwaukee, Wis.
- Robbins & Myers Co., Springfield, O.
- Wagner Electric Mfg. Co., St. Louis
- Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LAMPS

- General Electric Co., Schenectady, N. Y.
- Westinghouse Lamp Co., N. Y.

ELECTRIC LIGHTING PLANTS

- Allis-Chalmers Mfg. Co., Milwaukee
- Climax Eng. Co., Clinton, Ia.
- Cook Motor Co., Delaware, O.
- Cushman Motor Works, Lincoln, Neb.
- Fairbanks, Morse & Co., Chicago
- Fuller & Johnson Mfg. Co., Madison, Wis.
- General Electric Co., Schenectady, N. Y.
- Graybar Electric Co., New York
- Kohler Co., Kohler, Wis.
- Klauer Mfg. Co., Dubuque, Iowa
- Sunbeam Electric Mfg. Co., Evansville, Ind.
- Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC TRANSFORMERS

- Allis-Chalmers Mfg. Co., Milwaukee

- General Electric Co., Schenectady, N. Y.
- Kuhlman Electric Co., Bay City, Mich.
- Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC WIRES (See Wire)

ELEVATORS, BUCKET

- *Atlas Engineering Co., Clintonville, Wis.
- *Austin-Western Rd. Machy. Co., Chicago
- *Chain Belt Co., Milwaukee, Wis.
- *Fairfield Engineering Co., Marion, Ohio
- *Good Rds. Machy. Co., Kennett Sq., Pa.
- *Geo. Haiss Mfg. Co., N. Y.
- *Industrial Brownhoist Corp., Cleveland
- Abrams Cement Tool Co., Detroit
- Austin Mfg. Co., Chicago
- C. O. Bartlett & Snow Co., Cleveland, O.
- Gifford-Wood Co., Hudson, N. Y.
- Hendrick Mfg. Co., Carbondale, Pa.
- Jeffrey Mfg. Co., Columbus, O.
- Link-Belt Co., Chicago
- Littleford Bros., Cincinnati
- New Holland Mch. Co., N. Holland, Pa.
- Robt. Convertible Belling Co., N. Y.
- Russell Grader Mfg. Co., Minneapolis
- Spears-Wells Machy. Co., Oakland, Cal.
- Stephens-Adams Mfg. Co., Aurora, Ill.
- Univ. Rd. Machy. Co., Kingston, N. Y.
- Webster Mfg. Co., Chicago
- Weller Mfg. Co., Chicago
- Worthington Pump & Mch. Corp., N. Y.

ELEVATORS, PASSENGER, FREIGHT, ETC.

- Am. Elev. & Mach. Co., Louisville, Ky.
- Atlantic Elev. Co., Inc., Philadelphia
- Bay State Elev. Co., Springfield, Mass.
- Haughton Elev. & Mach. Co., Toledo, O.
- Llewellyn Ir. Wks., Los Angeles, Cal.
- Montgomery Elevator Co., Moline, Ill.
- Otis Elevator Co., N. Y.
- O. Ridgway & Son Co., Coatesville, Pa.
- B. See Electric Elevator Co., N. Y.
- Spaldal Elevator Corp., Reading, Pa.
- Warner Elevator Mfg. Co., Cincinnati
- Warsaw Elevator Co., Warsaw, N. Y.
- Westinghouse Elec. Elevator Co., E. Pittsburgh, Pa.

ENGINES, DREDGING

- Murray Iron Works Co., Burlington, Ia.

ENGINES, GAS AND GASOLINE

- *Caterpillar Tractor Co., San Leandro, Cal.
- *Continental Motors Corp., Muskegon, Mich.
- *Domestic Eng. & Pump Co., Shippensburg, Pa.
- *Electric Wheel Co., Quincy, Ill.
- *Hercules Motors Corp., Canton, O.
- *John Lanson Mfg. Co., New Holstein, Wis.
- *Le Roi Co., Milwaukee
- *Nove Engine Co., Lansing, Mich.
- *Sanderson-Cyclone Drill Co., Orrville, O.
- *Stover Mfg. & Eng. Co., Freeport, Ill.
- *Waukesha Motor Co., Waukesha, Wis.
- Alamo Engine Co., Hillsdale, Mich.
- Allis-Chalmers Mfg. Co., Milwaukee
- Beaver Mfg. Co., Milwaukee, Wis.
- Buda Co., Harvey, Ill.
- Charter Gas Engine Co., Sterling, Ill.
- Chicago Pneumatic Tool Co., N. Y.
- Climax Engineering Co., Clinton, Ia.
- Cook Motor Co., Delaware, O.
- Cushman Motor Works, Lincoln, Neb.
- Erted Mfg. Co., Portland, Ore.
- Evinrude Motor Co., Milwaukee
- Fairbanks, Morse & Co., Chicago
- Foss Gas Engine Co., Springfield, O.
- Fuller & Johnson Mfg. Co., Madison, Wis.
- Hinkley Motors, Inc., Detroit
- F. Van Rossum Hoogendyk, New York
- Ingersoll-Rand Co., New York
- Minneapolis Steel & Machinery Co., Minneapolis, Minn.
- Servel Mfg. Co., Evansville, Ind.
- Sterling Engine Co., Buffalo, N. Y.
- Universal Motor Co., Oakbrook, Wis.
- Weber Engine Co., Kansas City, Mo.
- Wisconsin Motor Mfg. Co., Milwaukee
- Witte Engine Works, Kansas City, Mo.
- Worthington Pump & Mch. Corp., N. Y.

ENGINES, HOISTING (See Hoists)

ENGINES, INDUSTRIAL (See Power Plants, Industrial)

ENGINES, KEROSENE

- *Electric Wheel Co., Quincy, Ill.
- *Hercules Motors Corp., Canton, O.
- *John Lanson Mfg. Co., New Holstein, Wis.
- *Stover Mfg. & Eng. Co., Freeport, Ill.
- *Waukesha Motor Co., Waukesha, Wis.
- Alamo Engine Co., Hillsdale, Mich.
- Climax Engineering Co., Clinton, Ia.
- Fuller & Johnson Mfg. Co., Madison, Wis.
- Witte Engine Works, Kansas City, Mo.



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If you do not know the notable work of CLETRAC Crawler Tractors—their remarkable ability to cut costs and speed up work on all road operations and contract jobs—mail the coupon or write, today, for the complete story.

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Send full details of Cletrac
for industrial work.

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Where to Purchase

ENGINES, OIL, DIESEL

*Stover Mfg. & Eng. Co., Freeport, Ill.
 Allis-Chalmers Mfg. Co., Milwaukee
 Anderson Engine & Fdry. Co., Anderson, Ind.
 Baumann Gas Eng. Co., Grove City, Pa.
 Bethlehem Steel Co., Bethlehem, Pa.
 Bucyrus Machinery Co., Lima, O.
 Busch Sulzer Bros.-Diesel Eng. Co., St. Louis
 Charter Gas Engineering Co., Sterling, Ill.
 Chicago Pneumatic Tool Co., New York
 De La Vergne Machinery Co., New York
 Fairbanks, Morse & Co., Chicago
 Falcon Iron Works Co., St. Louis
 Ingersoll-Rand Co., New York
 Lombard Governor Co., Ashland, Mass.
 McIntosh & Seymour Corp., Auburn, N. Y.
 Muncie Oil Engine Co., Muncie, Ind.
 New London Ship & Eng. Co., Groton, Ct.
 Nordberg Mfg. Co., Milwaukee, Wis.
 St. Mary's Oil Eng. Co., St. Charles, Mo.
 Taylor Machinery Co., Cleveland, O.
 F. Van Rossum Hoogendyk, New York
 Weber Engineering Co., Kansas City, Mo.
 Western Machy. Co., Los Angeles, Cal.
 Worthington Pump & Machy. Corp., N. Y.

ENGINES, PUMPING

*Hercules Motors Corp., Canton, O.
 *Stover Mfg. & Eng. Co., Freeport, Ill.
 *Waukesha Motor Co., Waukesha, Wis.
 Allis-Chalmers Mfg. Co., Milwaukee
 Climax Engineering Co., Clinton, Ia.
 Hooven, Owens, Ransdell Co., Hamilton, O.
 Murray Iron Works, Burlington, Ia.
 Nordberg Mfg. Co., Milwaukee
 Worthington Pump & Machy. Corp., N. Y.

ENGINES, SWINGING

*Lidgerwood Mfg. Co., Elizabeth, N. J.
 *J. S. Mundy Htg. Engine Co., Newark, N. J.
 Duke Engine Co., Grand Haven, Mich.

EXCAVATING MACHINERY (See Names Under Excavators, Also Steam Shovels)

EXCAVATORS, CABLEWAY

*Beaumont Mfg. Co., Philadelphia
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *Bauer Bros., Inc., Chicago
 *Ertel Mfg. Co., Portland, Ore.
 Link-Belt Co., Chicago
 Street Bros. Machinery Works, Chattanooga

EXCAVATORS, CRAWLING TRACTOR

*Bucyrus-Erie Co., Erie, Pa.
 *Tracton Co., Milwaukee, Wis.
 *Industrial Brownhoist Corp., Cleveland
 *Osgood Company, Marion, Ohio
 W. M. Blair Mfg. Co., Chicago, Ill.
 Byers Machine Co., Ravenna, O.
 General Excavator Co., Marion, Ohio

EXCAVATORS, DITCH AND TRENCH

*Barber-Greene Co., Aurora, Ill.
 *Bay City Shovel, Inc., Bay City, Mich.
 *Bucyrus-Erie Co., Erie, Pa.
 *Geo. Halsey Mfg. Co., New York
 *Hayward Co., New York
 *Industrial Brownhoist Corp., Cleveland
 *Insley Mfg. Co., Indianapolis, Ind.
 *Keystone Driller Co., Beaver Falls, Pa.
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *Manitowoc Engr. Wks., Manitowoc, Wis.
 *Osgood Company, Marion, Ohio
 *Parsons Co., Newton, Ia.
 *Thew Shovel Co., Lorain, O.

Austin Mach. Corp., Muskegon, Mich.
 Bucyrus Tractor Ditcher Co., Findlay, O.
 Byers Machine Co., Ravenna, O.
 Cleveland Trencher Co., Euclid, O.
 Economy Exe. Co., Iowa Falls, Ia.
 Ertel Mfg. Co., Portland, Ore.
 General Excavator Co., Marion, Ohio
 Link-Belt Co., Chicago
 Marion Steam Shovel Co., Marion, O.
 Monaghan Machinery Co., Chicago
 Ohio Power Shovel Co., Lima, Ohio
 Orton Crane & Shovel Co., Chicago
 Owensboro Ditcher & Grader Co., Owensboro, Ky.
 Russell Grader Mfg. Co., Minneapolis
 Speeder Machy. Corp., Cedar Rapids, Ia.
 Star Drilling Machinery Co., Akron, O.
 Street Bros. Machine Works, Chattanooga
 C. T. Topping Machinery Co., Dayton, O.

EXCAVATORS, DRAG-LINE

*Bay City Shovel, Inc., Bay City, Mich.
 *Beaumont Mfg. Co., Philadelphia
 *Bucyrus-Erie Co., Erie, Pa.
 *L. P. Green, Chicago
 *Hayward Co., New York
 *Industrial Brownhoist Corp., Cleveland
 *Kochring Co., Milwaukee
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *Manitowoc Engr. Wks., Manitowoc, Wis.
 *Osgood Company, Marion, Ohio
 *Bauer Bros., Inc., Chicago
 *Thew Shovel Co., Lorain, O.
 Amer. Hoisting & Derrick Co., St. Paul
 Austin Machy. Corp., Muskegon, Mich.
 Byers Machine Co., Ravenna, O.
 Economy Exe. Co., Iowa Falls, Ia.
 Ertel Mfg. Co., Portland, Ore.
 G. L. Gade, Iowa Falls, Ia.
 General Excavator Co., Marion, Ohio

Gallon Iron Wks. & Mfg. Co., Gallon, O.
 Harnischfeger Corp., Milwaukee, Wis.
 Link-Belt Co., Chicago
 Marion Steam Shovel Co., Marion, O.
 Monaghan Machinery Co., Chicago
 Ohio Power Shovel Co., Lima, O.
 Orton Crane & Shovel Co., Chicago
 Page Engineering Co., Chicago
 Russell Grader Mfg. Co., Minneapolis
 Speeder Machy. Corp., Cedar Rapids, Ia.
 Star Drilling Machinery Co., Akron, O.
 Street Bros. Machine Works, Chattanooga

EXPANDED METAL

*Truscon Steel Co., Youngstown, O.
 Berger Mfg. Co., Canton, Ohio
 Consolidated Exp. Metal Co., Wheeling, W. Va.
 Decatur Cornish & Roofing Co., Albany, Ala.
 Northwestern Exp. Metal Co., Chicago
 Wheeling Corrugating Co., Wheeling, W. Va.
 Youngstown Pressed Steel Co., Warren, O.

EXPANSION JOINT MATERIAL

*Barber Asphalt Co., Philadelphia
 *Barrett Co., New York
 *Phillip Carey Co., Cincinnati, O.
 *W. E. Meadows, Inc., Elgin, Ill.
 *Truscon Steel Co., Youngstown, O.
 Hoocher Asphalt Co., Alexandria, Ind.
 Pioneer Asphalt Co., Lawrenceville, Ill.
 Serviced Products Corp., Chicago
 Texas Co., New York
 Waring-Underwood Co., Philadelphia

EXPLOSIVES

Atlas Powder Co., Wilmington, Del.
 Austin Powder Co., Cleveland, O.
 Egyptian Powder Co., East Alton, Ill.
 E. L. Du Pont de Nemours & Co., Wilmington, Del.
 Equitable Powder Mfg. Co., E. Alton, Ill.
 Giant Powder Co., San Francisco, Cal.
 Grasselli Powder Co., Cleveland, O.
 Hercules Powder Co., Wilmington, Del.
 Ill. Powder Mfg. Co., St. Louis, Mo.
 King Powder Co., Cincinnati, O.
 Union Explosives Co., Clarksburg, W. Va.
 U. S. Powder Co., Terre Haute, Ind.

FENCING

*American Steel & Wire Co., Chicago
 Adrian Wire Fence Co., Adrian, Mich.
 Amer. Fence & Const. Co., New York
 Anchor Post Fence Co., New York
 Cyclone Fence Co., Waukegan, Ill.
 Diggins Wire Fence Co., Anderson, Ind.
 Edwards Mfg. Co., Cincinnati
 Ill. Wire & Mfg. Co., Joliet, Ill.
 Ind. Steel & Wire Co., Muncie, Ind.
 Interlocking Fence Co., Morton, Ill.
 Keystone Steel & Wire Co., Peoria, Ill.
 Kokomo Steel & Wire Co., Kokomo, Ind.
 Mich. Wire Fence Co., Adrian, Mich.
 Nitselman Bros., Muncie, Ind.
 Page Stl. & Wire Prod. Corp., Bridgeport, Ct.
 Pittsburgh Steel Co., Pittsburgh, Pa.
 Stewart Ir. Wks. Co., Cincinnati, O.
 Tex. Cyclone Fence Co., Ft. Worth, Tex.
 Van Dorn Iron Works Co., Cleveland, O.
 Wayne Iron Works, Wayne, Pa.
 Wickwire-Spencer Steel Co., New York

FILING EQUIPMENT, STEEL

Art Metal Constr. Co., Jamestown, N. Y.
 Berger Mfg. Co., Canton, O.
 Canton Art Metal Co., Canton
 Gen. Fireproofing Co., Youngstown, O.
 Van Dorn Iron Works Co., Cleveland, O.

FILTERS, OIL

S. F. Bowser & Co., Inc., Ft. Wayne, Ind.

FILTERS, WATER

Amer. Water Softener Co., Philadelphia, Pa.
 Cochran Corp., Philadelphia, Pa.
 Graver Corporation, E. Chicago, Ind.
 International Filter Co., Chicago
 Norwood Engineering Co., Florence, Mass.
 Roberts Filter Co., Darby, Pa.
 W. B. Sealf & Sons, Pittsburgh, Pa.

FINISHING MACHINES, CONCRETE ROAD (See Concrete Road Finishers)

FIRE & POLICE ALARM SYSTEMS

Ganewell Co., Newton Upper Falls, Mass.
 Harrington-Seaborg Corp., Melrose, Ill.
 Sterling Siren Fire Alarm Co., Rochester, N. Y.

FIRE ALARM SIRENS

Erick Electric Siren Co., St. Paul, Minn.
 Federal Sign System, Chicago
 Hendrie & Bolthoff Mfg. & Sup. Co., Denver, Colo.
 Holtzer-Cabot Electric Co., Boston
 Sterling Siren Fire Alarm Co., Rochester, N. Y.
 Union Water Meter Co., Worcester, Mass.

FIRE APPARATUS, MOTOR

Ahrens-Fox Fire Eng. Co., Cincinnati, Ohio
 Amer.-La. France & Foamite Corp., New York
 Boyer Fire Apparatus Co., Logansport, Ind.
 Broadway Motor Fire Apparatus Co., Cortlandt, N. Y.
 Buffalo Fire Appl. Corp., Buffalo, N. Y.

Hale Fire Pump Co., Conshohocken, Pa.
 Mack Trucks, Inc., New York
 Northern Fire Apparatus Co., Minneapolis, Minn.
 Peter Pirsch & Sons Co., Kenosha, Wis.
 Prospect Fire Engine Co., Prospect, Ohio
 Seagrave Co., Columbus, Ohio
 Waterson Fire Eng. Works, St. Paul, Minn.
 White Co., Cleveland

FIRE HOSE (See Hose, Fire)

FLEXIBLE JOINTS

*Central Foundry Co., New York
 *U. S. C. I. Pipe & Fdry Co., Burlington, N. J.
 Coldwell-Wilex Co., Newburgh, N. Y.
 Crane Co., Chicago
 United Lead Company, New York

FLOOD LIGHTING PROJECTORS

B. R. T. Corp., Philadelphia, Pa.
 Crouse-Hinds Co., Syracuse, N. Y.
 General Electric Co., Schenectady
 Sperry Gyroscope Co., Brooklyn, N. Y.

FLOOD LIGHTS, PORTABLE

*Alexander Milburn Co., Baltimore
 *National Carbide Sales Corp., New York
 *Oxweld Acetylene Co., New York
 General Electric Co., Schenectady, N. Y.
 Kohler Co., Kohler, Wis.
 Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.

FLOORING, COMPOSITION

*Barber Asphalt Co., Philadelphia
 *Barrett Co., New York
 Am. Mason Safety Tr. Co., Lowell, Mass.
 Johns-Manville, Inc., New York
 Marine Decking & Sup. Co., Philadelphia, Pa.
 Franklyn R. Muller & Co., Waukegan, Ill.

FLOORS, WOOD BLOCK

*Barrett Co., New York
 Carter Blomend Flooding Co., Kansas City, Mo.
 Jennison-Wright Co., Toledo, Ohio
 Midland Cress. Co., Toledo, Ohio
 Republic Cress. Co., Indianapolis, Ind.
 Sou. Wood Preserving Co., Atlanta, Ga.
 Wyckoff Pipe & Cress. Co., New York

FLUSH TANKS

Pacific Flush Tank Co., Chicago and N. Y.

FLUSHERS, STREET (See Street Flushers and Sprinklers)

FORGES, OIL (Rivet Heating)

Hauk Mfg. Co., Brooklyn, N. Y.
 Mead-Morrison Mfg. Co., E. Boston

FORMS, CONCRETE ROAD

*Blaw-Knox Co., Pittsburgh, Pa.
 *Heltzel Stl. Form & Ir. Co., Warren, Ohio
 *Lakewood Eng. Co., Cleveland, Ohio
 *Truscon Steel Co., Youngstown, Ohio
 Hotchkiss Stl. Products Co., Binghamton, N. Y.
 Metal Forms Corp., Milwaukee

FORMS, CONCRETE PIPE

*Blaw-Knox Co., Pittsburgh, Pa.
 *Heltzel Steel Form & Iron Co., Warren, O.
 Concrete Form Co., Syracuse, N. Y.
 Eclipse Mach. Co., Kendallville, Ind.
 Martin Iron Works, Los Angeles, Cal.
 Quinn Wire & Iron Works, Boone, Iowa

FORMS, MANHOLE, PIPE, SEWER, ETC.

*Blaw-Knox Co., Pittsburgh, Pa.
 *Heltzel Stl. Form & Ir. Co., Warren, Ohio

FORMGRADERS

Ted Carr & Co., Chicago

FOUNTAINS, DRINKING

Jas. B. Clow & Sons, Chicago
 Crane Co., Chicago
 Hedges-Walsh-Weidner Co., Chattanooga
 Murdock Mfg. & Sup. Co., Cincinnati
 Pure San. Dr. Fta. Co., Haverhill, Mass.
 Rundle-Spence Mfg. Co., Milwaukee
 Stewart Iron Works Co., Cincinnati, Ohio
 Halsey W. Taylor Co., Warren, Ohio
 Century Brass Works, Belleville, Ill.

FRESNOES (See Scrapers, Rotary)

GAGES, WATER LEVEL

Bristol Co., Waterbury, Conn.
 Builders Iron Foundry, Providence, R. I.
 W. & L. E. Gurley, Troy, N. Y.
 Lunkenheimer Co., Cincinnati, Ohio
 Simplex Valve & Meter Co., Phila.
 Walworth Mfg. Co., Boston



The crawler mounting of The Pony-Ditcher is over ten feet long, is electrically welded to provide strength with light weight, and fitted with bronze bushings, lubricated by a modified one shot system.

The crawler is very easily steered; it's self cleaning sprockets and crawler shoes are made of special steel and the construction throughout is in keeping with the high quality of the rest of the machine.

Better Crawlers ~ Bigger Output With The 1929 Model Pony - Ditcher

Watch The Pony-Ditcher chew its way through the toughest going...you will marvel at the speedy way it eats dirt...at its power...capacity...ease of steering and simplicity of control.

A dozen or more exclusive features of Pony-Ditcher design make it an outstanding buy among machines of its class. Notice for example, the welded steel crawler and upper frames, the individually self cleaning buckets, the ball bearings used on all high speed shafts and the modified one shot crawler lubrication. Certainly this is the last

word in ditching machinery design.

One man and a Pony-Ditcher will dig more ditch for you than a whole crew of laborers; and it will do the job in less time, at lower costs and at a correspondingly greater profit.

If you are interested in lower ditching costs, write for a copy of The Pony-Ditcher booklet. It describes the many advantages of this machine as well as the work it will do; or get in touch with our nearest representative, he will gladly give you the facts.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST

Where to Purchase

GARBAGE CANS (See Cans)

GARBAGE COLLECTION EQUIPMENT

*Highway Trailer Co., Edgerton, Wis.
 Atlas Sales Corp., New York City
 Detroit Trailer & Mach. Co., Detroit
 Freshair Trailer Co., Detroit, Mich.
 Hill Co., Milwaukee
 Geo. H. Holshag & Bros., Jeffersonville, Ind.
 Lee Trailer & Body Co., Plymouth, Ind.
 Littleford Bros., Cincinnati
 B. Nicoll & Co., New York
 Smith Trailer Co., Syracuse, N. Y.
 Troy Trailer & Wagon Co., Troy, Ohio

GARBAGE DISPOSAL SYSTEMS

American Beccari Corp., New York
 C. O. Bartlett & Snow Co., Cincinnati
 Decarie Incinerator Co., L. I. City, N. Y.
 Goder Incinerator Corp., Chicago
 Hiller Eng. & Const. Co., Brooklyn, N. Y.
 Morse-Boulger Destructor Co., New York
 Nye Odorless Crematory Co., Mason, Ga.
 Pittsburgh-Das Molnes Steel Co., Pittsburgh, Pa.
 Superior Incinerator Co. of Dallas, Dallas, Tex.

GASOLINE STORAGE TANKS

Biggs Boiler Works, Akron, Ohio
 Birmingham Tank Co., Birmingham, Ala.
 S. F. Bower & Co., Inc., Ft. Wayne, Ind.
 Chicago Bridge & Iron Works, Chicago
 Graver Corp., East Chicago, Ind.
 Hill Co., Milwaukee, Wis.
 Lancaster Iron Works, Inc., Lancaster, Pa.
 Littleford Bros., Cincinnati, Ohio
 Wm. B. Seale & Sons, Pittsburgh, Pa.
 Tekheim Oil Tank & Pump Co., Ft. Wayne, Ind.
 United Iron Works, Inc., Kansas City, Mo.
 Wayne Co., Fort Wayne, Ind.

GATES, SLUICE

Chapman Valve Mfg. Co., Indian Orchard, Mass.
 Coffin Valve Co., Boston, Mass.
 Coldwell-Wilcox Co., Newburgh, N. Y.
 R. Hardesty Mfg. Co., Denver
 Rodney Hunt Machine Co., Orange, Mass.
 Ludlow Valve Mfg. Co., Troy, N. Y.

GATES FOR PARKS AND CEMETERIES

Stewart Iron Works Co., Cincinnati, Ohio
 Wayne Iron Works, Wayne, Pa.

GLASS, FIREPROOF (See Wire Glass)

GRADERS, ROAD (See Road Graders)

GRADER BLADES

*General Wheelbarrow Co., Cleveland, O.
 J. D. Adams & Co., Indianapolis, Ind.
 Gallion Jr. Works & Mfg. Co., Gallion, Ohio
 Russell Grader Mfg. Co., Minneapolis
 Shunk Mfg. Co., Decatur, Ohio

GRAND STANDS, PORTABLE

Circle-A Prod. Corp., Newcastle, Ind.
 Leavitt Mfg. Co., Urbana, Ill.
 Wayne Iron Works, Wayne, Pa.

GRATING, STEEL

*Blaw-Knox Co., Pittsburgh
 Hendrick Mfg. Co., Carbondale, Pa.

GREASE

*D-A Lubricant Co., Inc., Indianapolis
 *Jos. Dixon Crucible Co., Jersey City, N. J.

GRIDELIES

Allis-Chalmers Mfg. Co., Milwaukee
 Austin Mfg. Co., Chicago
 Robins Conv. Belt Co., New York
 Smith Engineering Works, Milwaukee
 Stephens-Adamson Mfg. Co., Angola, Ill.

GUARD RAIL, HIGHWAY

*Am. Steel & Wire Co., Chicago
 *J. H. Ramsey, Albany, N. Y.
 *Williamsport Wire Rope Co., Williamsport, Pa.
 Cyclone Fence Co., Waukegan, Ill.
 W. S. Godwin Co., Baltimore, Md.
 Hazard Wire Rope Co., Wilkes-Barre, Pa.
 W. F. Robertson Bldg. & Iron Co., Cincinnati
 Stewart Iron Works Co., Cincinnati
 Wickwire-Spencer Steel Co., New York

HAMMERS, STEAM, PILE (See Pile Hammers, Steam)

HEATING KETTLES (See Kettles)

HITCHES

*Gustav Schaefer Co., Cleveland, Ohio
 Detroit Trailer & Machine Co., Detroit
 Trail-T Co., St. Paul, Minn.
 Whitehead & Kales Co., Detroit

HOISTS, BELT-DRIVEN

*Amer. Saw Mill Mch. Co., Hackettstown, N. J.
 *Brown Clutch Co., Sandusky, Ohio
 *Dobbie Fdry. & Mach. Co., Niagara Falls
 *Domestic Engine & Pump Co., Shippensburg, Pa.
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *J. S. Mundy Htg. Engine Co., Newark, N. J.
 American Hoist & Derrick Co., St. Paul, Minn.
 Mead-Morrison Mfg. Co., Boston, Mass.
 Street Bros. Mach. Works, Chattanooga
 Universal Hoist & Mfg. Co., Cedar Falls, Ia.
 Weller Mfg. Co., Chicago
 William Hoist Co., Los Angeles, Calif.

HOISTS, CONCRETE, TOWER

*Brown Clutch Co., Sandusky, Ohio
 *C. H. & E. Mfg. Co., Milwaukee, Wis.
 *Domestic Eng. & Pump Co., Shippensburg, Pa.
 *Inley Mfg. Co., Indianapolis, Ind.
 *Lakewood Eng. Co., Cleveland, Ohio
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *J. S. Mundy Htg. Engine Co., Newark, N. J.
 *Novo Engine Co., Lansing, Mich.
 *Ransome Conc. Mch. Co., Dunellen, N. J.
 English Bros. Machy Co., Kansas City
 Mead-Morrison Mfg. Co., Boston
 Street Bros. Mach. Works, Chattanooga

HOISTS, ELECTRIC

*Brown Clutch Co., Sandusky, Ohio
 *C. H. & E. Mfg. Co., Milwaukee, Wis.
 *Clyde Iron Works Sales Co., Duluth, Minn.
 *Construction Machy. Co., Waterloo, Ia.
 *Dobbie Fdry. & Mach. Co., Niagara Falls
 *Domestic Eng. & Pump Co., Shippensburg, Pa.
 *S. Flory Mfg. Co., Bangor, Pa.
 *Industrial Brownhoist Corp., Cleveland
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *J. S. Mundy Htg. Engine Co., Newark, N. J.
 *Novo Engine Co., Lansing, Mich.
 *O. K. Clutch & Mach. Co., Columbia, Pa.
 *Sterling Machinery Corp., Kansas City, Mo.
 *Sullivan Machy. Co., Chicago
 Am. Hoist & Derrick Co., St. Paul, Minn.
 Chisholm-Moore Co., Cleveland, Ohio
 Dake Eng. Co., Grand Haven, Mich.
 Norris K. Davis San Francisco, Calif.
 English Bros. Machy Co., Kansas City, Mo.
 Ersted Mfg. Co., Portland, Ore.
 Harnischfeger Corp., Milwaukee
 Mead-Morrison Mfg. Co., Boston
 National Hoisting Eng. Co., Harrison, N. J.
 Northern Engineering Works, Detroit
 Street Bros. Mach. Works, Chattanooga
 Thomas Elevator Co., Chicago
 Treadwell Engineering Co., Easton, Pa.
 Universal Hoist & Mfg. Co., Cedar Falls, Iowa
 Vulcan Iron Works, Wilkes-Barre, Pa.
 Williams Hoist Co., Los Angeles, Calif.

HOISTS, GASOLINE

*Amer. Cement Mach. Co., Inc., Keokuk, Iowa
 *Amer. Saw Mill Mch. Co., Hackettstown, N. J.
 *Brown Clutch Co., Sandusky, Ohio
 *C. H. & E. Mfg. Co., Milwaukee
 *Clyde Iron Works Sales Co., Duluth, Minn.
 *Construction Machy. Co., Waterloo, Ia.
 *Domestic Eng. & Pump Co., Shippensburg, Pa.
 *S. Flory Mfg. Co., Bangor, Pa.
 *Lansing Co., Lansing, Mich.
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *J. S. Mundy Htg. Engine Co., Newark, N. J.
 *Novo Engine Co., Lansing, Mich.
 *O. K. Clutch & Mach. Co., Columbia, Pa.
 *Sterling Machinery Corp., Kansas City, Mo.
 Am. Hoist & Derrick Co., St. Paul, Minn.
 Amer. Mfg. & Eng. Co., Kalamazoo, Mich.
 Austin Mfg. Co., Chicago
 Beach Mfg. Co., Charlotte, Mich.
 Buffalo Hoist & Derrick Co., Buffalo, N. Y.
 Dake Eng. Co., Grand Haven, Mich.
 Dyrre Mfg. Co., Huntington Park, Calif.
 Norris K. Davis San Francisco, Calif.
 English Bros. Machy Co., Kansas City, Mo.
 Ersted Mfg. Co., Portland, Ore.
 Mead-Morrison Mfg. Co., Boston
 National Hoisting Eng. Co., Harrison, N. J.
 Orr & Sombower, Reading, Pa.
 Street Bros. Mach. Works, Chattanooga
 Thomas Elevator Co., Chicago
 Universal Hoist & Mfg. Co., Cedar Falls, Iowa
 Williams Hoist Co., Los Angeles, Calif.

HOISTS, HAND

*Beebe Bros., Inc., Seattle, Wash.
 *Dobbie Fdry. & Machine Co., Buffalo, N. Y.

HOISTS, PNEUMATIC

*Independent Pneu. Tool Co., Chicago, Ill.
 *Sullivan Machy. Co., Chicago
 Chicago Pneumatic Tool Co., New York
 Curtis Pneumatic Mch. Co., St. Louis
 Dake Eng. Co., Grand Haven, Mich.
 Detroit Hoist & Mach. Co., Detroit
 Gardner-Deaver Co., Quincy, Ill.
 Gilman Mfg. Co., E. Boston, Mass.
 Hanna Engineering Works, Chicago

Ingersoll-Rand Co., New York
 Mead-Morrison Mfg. Co., Boston
 Northern Eng. Works, Detroit, Mich.
 Worthington Pump & Mch. Corp., N. Y.

HOISTS, PORTABLE

*Beebe Bros., Inc., Seattle, Wash.
 *Brown Clutch Co., Sandusky, Ohio
 *C. H. & E. Mfg. Co., Milwaukee, Wis.
 Ersted Mfg. Co., Portland, Ore.
 Joliet Mfg. Co., Joliet, Ill.
 Jas. B. Seaverns Co., Batavia, Ill.

HOISTS, STEAM

*Clyde Iron Works Sales Co., Duluth, Minn.
 *S. Flory Mfg. Co., Bangor, Pa.
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *J. S. Mundy Htg. Engine Co., Newark, N. J.
 *Sullivan Machinery Co., Chicago
 Am. Hoist & Derrick Co., St. Paul, Minn.
 Dake Eng. Co., Grand Haven, Mich.
 Hardie-Tynes Mfg. Co., Birmingham, Ala.
 Ingersoll-Rand Co., New York
 Mead-Morrison Mfg. Co., Boston
 National Hoisting Eng. Co., Harrison, N. J.
 Orr & Sombower, Reading, Pa.
 Street Bros. Mach. Works, Chattanooga
 Thomas Elevator Co., Chicago
 Treadwell Engineering Co., Easton, Pa.

HOISTS FOR MOTOR TRUCKS

*Beebe Bros., Inc., Seattle, Wash.
 *Brown Clutch Co., Sandusky, Ohio
 *Lidgerwood Mfg. Co., Elizabeth, N. J.
 *Wood Hydr. Hoist & Body Co., Detroit
 Atlas Sales Corp., New York
 Ersted Mfg. Co., Portland, Ore.
 Hill Co., Milwaukee
 Hydr. Hoist Mfg. Co., St. Paul, Minn.
 Joliet Mfg. Co., Joliet, Ill.
 Van Dorn Iron Works Co., Cleveland, Ohio

HOPPERS, CONCRETE (Aggregate Measuring)

*Blaw-Knox Company, Pittsburgh, Pa.
 *Butler Bin Co., Waukegan, Wis.
 *Erie Steel Const'n Co., Erie, Pa.
 *Holtzel Stl. Form & Ir. Co., Warren, Ohio
 *Lakewood Eng. Co., Cleveland, Ohio
 *Ransome Conc. Mch. Co., Dunellen, N. J.
 C. S. Johnson Co., Champaign, Ill.
 Jas. B. Seaverns Co., Batavia, Ill.
 Superior Engineering Co., Warren, Ohio

HOSE, AIR

*The Buhl Company, Chicago
 *Independent Pneu. Tool Co., Chicago
 Chicago Pneumatic Tool Co., New York
 Cincinnati Rubber Mfg. Co., Cincinnati
 Cleveland Rock Drill Co., Cleveland, Ohio
 The Dallett Co., Philadelphia, Pa.
 Gilman Mfg. Co., East Boston, Mass.
 Goodyear Tire & Rubber Co., Akron, Ohio
 Ingersoll-Rand Co., New York
 Mulconroy Co., Inc., Philadelphia, Pa.
 Penna. Flexible Metallic Tubing Co., Phila.
 Republic Rubber Co., Youngstown, Ohio
 United States Rubber Co., New York

HOSE, FIRE

Ri-Lateral Fire Hose Co., Chicago
 Eureka Fire Hose Mfg. Co., New York
 Fabric Fire Hose Co., New York
 B. F. Goodrich Rubber Co., Akron, Ohio
 Goodyear Tire & Rubber Co., Akron, Ohio

HOUSE NUMBERS

Hamilton Metal Prod. Co., Hamilton, Ohio
 O. H. Hanson Co., Chicago
 Niagara Metal Stamping Corp., Niagara Falls, N. Y.

HOUSES, PORTABLE (See Portable Buildings)

HYDRANTS, FIRE

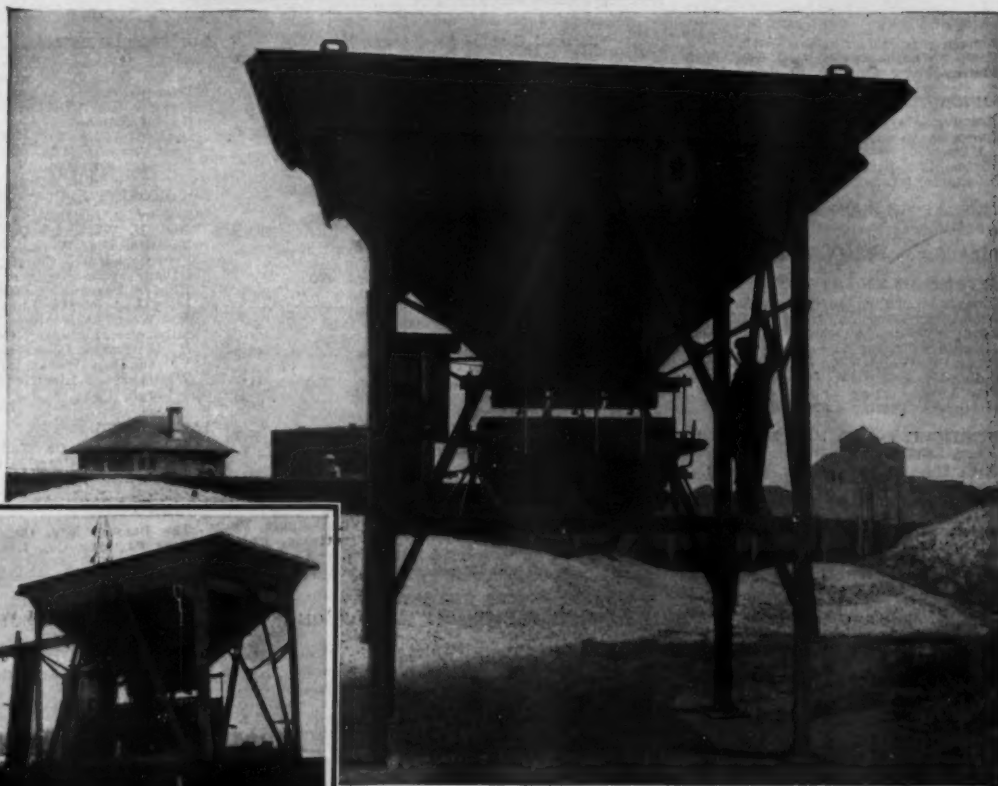
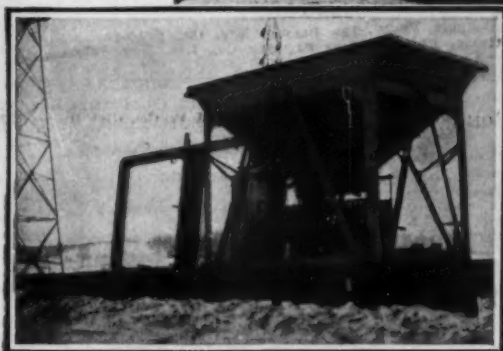
Chapman Valve Mfg. Co., Indian Orchard, Mass.
 Columbian Ir. Works, Chattanooga, Tenn.
 Darling Valve & Mfg. Co., Williamsport, Pa.
 Eddy Valve Co., Watertown, N. Y.
 Iowa Valve Co., Oskaloosa, Iowa
 Kennedy Valve Mfg. Co., Elmira, N. Y.
 Ludlow Valve Mfg. Co., Troy, N. Y.
 Michigan Valve & Fdry. Co., Detroit
 Norwood Eng. Co., Florence, Mass.
 Rensselaer Valve Co., Troy, N. Y.
 A. P. Smith Mfg. Co., E. Orange, N. J.
 Vogt Bros. Mfg. Co., Louisville, Ky.
 Waterous Co., St. Paul
 R. D. Wood & Co., Philadelphia, Pa.

HYDRAULIC RAMS

Deming Co., Salem, Ohio

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

Note how little room is required on a flat car for shipping the "V" 36. You can often save transportation charges on long moves because there is room for all other equipment on the same car.



The New V 36 Bin

THE new Butler "V" 36 cubic yard bin is especially designed and adapted for use by contractors where portability and convenience of handling are all-important features and where sufficient storage capacity must be provided to take care of the average job.

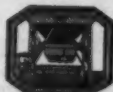
In moving the bin from one set-up to another, it is only necessary to lift off the top section—which is in one piece—no bolts to take out, as this part interlocks with the main portion of the bin. Unbolting the

four columns and eight knee-braces reduces the balance of the bin to such size that it ships on a railway car or can be handled on a truck.

The weighing hoppers and scales or volume measuring hoppers remain intact and no part need be removed or altered. For overhead operation the lower bin bracing may be utilized for attaching of platform—or ground operation may be easily arranged for either type of proportioning equipment.

BUTLER BIN COMPANY, WAUKESHA, WIS.

Representatives in



Fifty Principal Cities

BUTLER
Steel **BINS**



Where to Purchase

- Johnson Mfg. Co., Seattle, Wash.
 Life Hydraulic Engine Co., New York
 Ramsey Pump Co., Seneca Falls, N. Y.
- IGNITION SYSTEMS**
 *Hissmann Magneto Corp., New York
 American Bosch Magneto Corp., Springfield, Mass.
 Dayton Eng. Lab. Co., Dayton, Ohio
 Spilldorf Electric Co., Newark, N. J.
- INCINERATORS, GARBAGE (See Garbage Disposal)**
- INDICATOR POSTS (See Valves)**
- INSPECTING LABORATORIES**
 *Conard & Busby, Burlington, N. J.
 *Robert W. Hunt Co., Chicago, Ill.
 *Fatsig Testing Laboratories, Des Moines, Ia.
 Allentown Testing Laboratory, Allentown, Pa.
 E. L. Conwell & Co., Philadelphia, Pa.
 Gulick-Henderson Co., New York
 New York Testing Lab., New York
 Pittsburgh Testing Lab., Pittsburgh
- INSTRUMENTS AND SUPPLIES (Surveyors and Engineers)**
 Wm. Ainsworth & Sons, Denver, Col.
 L. Beckman Co., Toledo, Ohio
 C. L. Berger & Sons, Boston
 Brandis & Sons Mfg. Co., Brooklyn, N. Y.
 Buff & Buff Mfg. Co., Boston
 Eugene Dietzgen Co., Chicago
 W. & L. E. Gurley, Troy, N. Y.
 Keuffel & Esser Co., Hoboken, N. J.
 Kellogg & Co., New York
 A. Lietz Co., San Francisco
 Leopold-Volpel & Co., Portland, Ore.
 Lufkin Rule Co., Saginaw, Mich.
 Warren-Knight Co., Philadelphia, Pa.
 F. Weber & Co., Philadelphia, Pa.
 David White Co., Milwaukee, Wis.
- INTERNAL CURBS AND BASE FORMS (See Forms, Concrete)**
- IRON WORK, STRUCTURAL AND ORNAMENTAL (See Bridges and Buildings)**
- JACKS, LIFTING**
 *McKiernan-Terry Drill Co., New York
 *Templeton, Keady & Co., Chicago
 Duff Mfg. Co., Pittsburgh, Pa.
 Joyce-Orliland Co., Dayton, Ohio
 A. O. Norton, Inc., Moline, Ill.
 Oil Jack Co., New York
 Rees Mfg. Co., Pittsburgh, Pa.
 Watson-Stillman Company, New York
- JACKS, PIPE FORCING**
 *Templeton, Keady & Co., Chicago
 Duff Mfg. Co., Pittsburgh, Pa.
 Easy Mfg. Co., Lincoln, Neb.
- JAIL AND PRISON WORK**
 Fries & Son Steel Const. & Eng. Co., Covington, Ky.
 Manly Jail Works, Dalton, Ga.
 Peely Jail Building Co., St. Louis, Mo.
 Southern Prison Co., San Antonio, Tex.
 Stewart Iron Works Co., Cincinnati, Ohio
 Van Dorn Iron Works Co., Cleveland
- JOINTS, EXPANSION PAVING (See Expansion Joint Material)**
- JOINTS, FLEXIBLE PIPE (See Flexible Joints)**
- JOINTS, STEEL**
 *Truscon Steel Co., Youngstown, Ohio
 Berger Mfg. Co., Canton, Ohio
 Genfire Steel Co., Youngstown, Ohio
 Ingalls Steel Prod. Co., Birmingham, Ala.
- KETTLES, FOR ASPHALT AND TAR**
 *Barber Asphalt Co., Philadelphia, Pa.
 *Chausse Oil Burner Co., Elkhart, Ind.
 *Connery & Co., Inc., Philadelphia, Pa.
 *Good Roads Mch. Co., Kennett Square, Pa.
 *Joe. Hennerst Co., Cincinnati, Ohio
 *Union Iron Works, Inc., Hoboken, N. J.
 Acone Rd. Mach. Co., Frankfort, N. Y.
 Aswell Burner Co., West New York, N. J.
 Bosch Mfg. Co., Charlotte, Mich.
 Charleroi Iron Wks., Charleroi, Pa.
 Chase & Lyman, Boston, Mass.
 Hauck Mfg. Co., Brooklyn, N. Y.
 Kinney Mfg. Co., Boston, Mass.
 Lancaster Iron Works, Inc., Lancaster, Pa.
 Littleford Bros., Cincinnati, Ohio
 Macleod Co., Cincinnati, Ohio
 Spears-Wells Mch. Co., Oakland, Cal.
 G. L. Steubner Jr. Wks., Inc., Long Island City, N. Y.
 Tarrant Mfg. Co., Saratoga Springs, N. Y.
 Universal Rd. Mach. Co., Kingston, N. Y.
- LANTERNS, CONTRACTORS'**
 *R. E. Dietz Co., New York
 *Alex. Milburn Co., Baltimore, Md.
- *National Carbide Sales Corp., New York
 Deffance Lantern & Stamping Co., Rochester, N. Y.
 Economy Electric Lantern Co., Chicago
 Handlan, Beck Mfg. Co., St. Louis
 National Carbon Co., Inc., New York City
 Star Headlight & Lantern Co., Rochester, N. Y.
- LATH, METAL**
 *Truscon Steel Co., Youngstown, Ohio
 Berger Mfg. Co., Canton, Ohio
 Bostwick Steel Lath Co., Niles, Ohio
 Consolidated Exp. Metals Co., Wheeling, W. Va.
 Decatur Cornice & Roofing Co., Albany, Ala.
 Edwards Mfg. Co., Cincinnati
 Genfire Steel Co., Youngstown, Ohio
 Milwaukee Corr. Co., Milwaukee, Wis.
 Northwestern Exp. Metal Co., Chicago
 Penn. Metal Co., Boston, Mass.
 St. Paul Corr. Co., St. Paul, Minn.
 Sykes Metal Lath and Roofing Co., Niles, O.
 Wheeling Corr. Co., Wheeling, W. Va.
 Youngstown Pressed Steel Co., Warren, O.
- LAWN MOWERS**
 Chadborn & Coldwell Mfg. Co., Newburgh, N. Y.
 Coldwell Law Mower Co., Newburgh, N. Y.
 Gilson Mfg. Co., Fort Washington, Wis.
 Ideal Power Lawn Mower Co., Lansing, Mich.
 Jacobson Mfg. Co., Racine, Wis.
 Modern Mach. Works, Milwaukee
 Penna. Lawn Mower Works, Philadelphia, Pa.
 Phila. Lawn Mower Co., Philadelphia, Pa.
 S. P. Townsend Co., Bloomsfield, N. J.
 Worthington Mower Co., Stroudsburg, Pa.
- LAWN MOWER SHARPENERS**
 Fate-Root-Heath Co., Plymouth, Ohio
- LEAD-MELTING FURNACES**
 Aeroll Burner Co., West New York, N. J.
 Chicago Flexible Shaft Co., Chicago
 Hauck Mfg. Co., Brooklyn, N. Y.
 Littleford Bros., Cincinnati, Ohio
 A. P. Smith Mfg. Co., East Orange, N. J.
- LETTERING GUIDES**
 Wood-Regan Inst. Co., So. Orange, N. J.
- LIGHTS, ACETYLENE**
 *Alex. Milburn Co., Baltimore, Md.
 *Nat. Carbide Sales Corp., New York
 *Oxweld Acetylene Co., New York
 General Electric Co., Schenectady, N. Y.
 Kohler Co., Kohler, Wis.
 Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.
- LIGHTING STANDARDS (See Street Lamp Posts)**
- LIGHTS, WARNING**
 *Toledo Pressed Steel Co., Toledo, Ohio
 McCloskey Torch Co., Toledo, Ohio
 National Carbon Co., New York
- LIQUID CHLORINE**
 Arnold, Hoffman & Co., Inc., New York
 Electro Bleaching Gas Co., New York
 Hooker Electrochemical Co., New York
 Mathieson Alkali Works, Inc., New York
 Penna. Salt Mfg. Co., Philadelphia, Pa.
- LOADERS, GRAVEL, WAGON, CAR, ETC.**
 *Atlas Engineering Co., Clintonsville, Wis.
 *Barber-Greene Co., Aurora, Ill.
 *Bay City Shovel, Inc., Bay City, Mich.
 *Bucyrus-Erie Co., Erie, Pa.
 *Burch Corp., Crestline, Ohio
 *Chicago Automatic Conv. Co., Chicago
 *Fairfield Engineering Co., Marion, Ohio
 *Geo. Halsey Mfg. Co., N. Y.
 *Holtzel St. Form & Ir. Co., Warren, Ohio
 *Industrial Brownhoist Corp., Cleveland
 *Sanerman Bros., Chicago
 *Trackson Co., Milwaukee, Wis.
 Bonney Supply Co., Inc., Rochester, N. Y.
 Conant Mach. Co., Concord Junet., Mass.
 F. S. Mfg. Co., New Holstein, Wis.
 Gallon Iron Works & Mfg. Co., Gallon, Ohio
 Gifford-Wood Co., Hudson, N. Y.
 Hughes-Keenan Co., Mansfield, Ohio
 Jeffrey Mfg. Co., Columbus, Ohio
 Kent Machine Co., Kent, Ohio
 Lee Trailer & Body Co., Plymouth, Ind.
 Link-Belt Co., Chicago
 Logan Co., Louisville, Ky.
 Nelson Iron Works, Passaic, N. J.
 New Holland Mch. Co., N. Holland, Pa.
 Northern Conveyor Co., Janesville, Wis.
 Portable Machinery Co., Clifton, N. J.
 Russell Grader Mfg. Co., Minneapolis
 H. B. Sackett Serean & Chute Co., Chicago
 Spears-Wells Mch. Co., Oakland, Cal.
 Specialty Engineering Co., Philadelphia, Pa.
 Star Drilling Mach. Co., Akron, Ohio
 Universal Rd. Mach. Co., Kingston, N. Y.
 Weller Mfg. Co., Chicago
- LOOKERS, STEEL**
 All-Steel Equip. Co., Aurora, Ill.
 Berger Mfg. Co., Canton, Ohio
 Durabilt Steel Locker Co., Aurora, Ill.
 Durand Steel Locker Co., Chicago
 Hart & Hutchinson Co., N. Britain, Conn.
 Lyon Metallic Mfg. Co., Aurora, Ill.
 Fred. Medart Mfg. Co., St. Louis, Mo.
 Narragansett Mach. Co., Providence, R. I.
- LOCOMOTIVES, FOR CONTRACTORS, ETC.**
 *Brookville Locomotive Co., Brookville, Pa.
 *Geo. D. Whitcomb Co., Rochelle, Ill.
 Baldwin Loc. Works, Philadelphia, Pa.
 Fate-Root-Heath Co., Plymouth, Ohio
 Davenport Loc. Works, Davenport, Iowa
 Heister Locomotive Works, Erie, Pa.
 Lima Loc. Works, Lima, Ohio
 Mid-West Locomotive Works, Cincinnati
 Milwaukee Loc. Mfg. Co., Milwaukee
 H. K. Porter Co., Pittsburgh, Pa.
 Vulcan Iron Works, Wilkes-Barre, Pa.
 Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- LUBRICANTS**
 *D-A Lubricant Co., Indianapolis, Ind.
 *Joseph Dixon Crucible Co., Jersey City, N. J.
 Texas Co., New York
- LUBRICATORS**
 The Basic Mfg. Co., Chicago
 Carr Fastener Co., Cambridge, Mass.
- MANGANESE STEEL PRODUCTS**
 American Manganese St. Co., Chicago H'ts., Ill.
 Taylor-Wharton Ir. & St. Co., High Bridge, N. J.
- MANHOLE COVERS (See Castings)**
- METAL LATH (See Lath)**
- METAL ROOFING (See Roofing)**
- METER BOXES**
 Builders Iron Foundry, Providence, R. I.
 H. W. Clark Co., Mattoon, Ill.
 Clarksville Fdry. & Mach. Co., Clarksville, Tenn.
 J. B. Glow & Sons, Chicago
 Columbian Iron Works, Chattanooga, Tenn.
 Ford Meter Box Co., Wabash, Ind.
 Mueller Co., Decatur, Ill.
 J. S. Schofield's Sons Co., Macon, Ga.
- METER COUPLINGS**
 *Neptune Meter Co., New York
 H. W. Clark Co., Mattoon, Ill.
 Ford Meter Box Co., Wabash, Ind.
 Hersey Mfg. Co., So. Boston, Mass.
 Mueller Co., Decatur, Ill.
 Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
 Union Water Meter Co., Worcester, Mass.
- METER TESTERS**
 *Neptune Meter Co., New York
 H. W. Clark Co., Mattoon, Ill.
 Ford Meter Box Co., Wabash, Ind.
 Mueller Co., Decatur, Ill.
 National Meter Co., New York
 Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
- METERS, ELECTRIC (WATTHOUR)**
 Duncan Elec. Mfg. Co., LaFayette, Ind.
 General Electric Co., Schenectady, N. Y.
 Sangamo Electric Co., Springfield, Ill.
 Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- METERS, WATER, OIL & GASOLINE**
 *Neptune Meter Co., New York
 Badger Meter Mfg. Co., Milwaukee
 Buffalo Meter Co., Buffalo, N. Y.
 Federal Meter Corp., E. Orange, N. J.
 Gamon Meter Co., Newark, N. J.
 Hersey Mfg. Co., Boston, Mass.
 National Meter Co., New York
 Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
 Phoenix Meter Co., Prince Bay, St. Lal., N. Y.
 Thomson Meter Corp., New York
 Union Water Meter Co., Worcester, Mass.
 Worthington Pump & Mch. Corp., New York
- METERS, WATER (VENTURI TYPE)**
 Builders Iron Fdry., Providence, R. I.
 Simplex Valve & Meter Co., Philadelphia, Pa.
- MIXERS, CONCRETE (See Concrete Mixers)**
- MIXERS, GROUT**
 *Lakewood Eng. Co., Cleveland, Ohio
 *Union Iron Works, Inc., Hoboken, N. J.
 Kent Mach. Co., Cayahoga Falls, Ohio
 T. L. Smith Co., Milwaukee, Wis.



Don't Blast—"Mill" Through with the Barber-Greene

There are two big reasons why Barber-Greene Ditchers can lick the tough digging jobs that make ordinary ditchers call for high priced pick and shovel work—or even blasting.

First—the B-G Vertical Boom goes straight down—the shortest distance through the hard material.

Secondly—held solidly against the face, the B-G Vertical Boom “mills” through

material that ditchers with sloping booms cannot dig.

And back of the proven correctness of Barber-Greene design are parts made of special alloy steels where the strains and wear are hardest.

If you're looking for a ditcher that has speed—yet is built to dig through anything that's “diggable”—send for a copy of “Ditching Snapshots and Records.” There's no obligation.



BARBER-GREENE COMPANY, 485 W. Park Avenue, Aurora, Illinois

BARBER GREENE

Where to Purchase

MIXERS, MORTAR

- Atlas Engineering Co., Clintonville, Wis.
- C. H. & B. Mfg. Co., Milwaukee, Wis.
- Construction Mach'y Co., Waterloo, Iowa
- Holtzel St. Form & Ir. Co., Warren, Ohio
- Jaeger Machine Co., Columbus, Ohio
- Lakewood Eng. Co., Cleveland, Ohio
- Lansing Co., Lansing, Mich.
- John Lauson Mfg. Co., New Holstein, Wis.
- Ransome Conc. Mch'y. Co., Danellen, N. J.
- Anchor Mfg. Co., Chicago
- Archer Iron Works, Chicago
- Blystone Mfg. Co., Cambridge Spgs., Pa.
- Norris K. Davis, San Francisco, Calif.
- Kent Machine Co., Kent, Ohio
- Kiel Machine Co., Kiel, Wis.
- Knickerbocker Co., Jackson, Mich.
- Meill-Blumberg Co., New Holstein, Wis.
- T. L. Smith Co., Milwaukee, Wis.
- Standard Scale & Sup. Corp., Pittsburgh
- Talbot-Flood Mfg. Co., Kansas City, Mo.

MIXERS, PLASTER

- Atlas Engineering Co., Clintonville, Wis.
- Construction Mach'y Co., Waterloo, Iowa
- Jaeger Machine Co., Columbus, Ohio
- John Lauson Mfg. Co., New Holstein, Wis.
- Anchor Mfg. Co., Chicago
- Blystone Mfg. Co., Cambridge Spgs., Pa.
- Norris K. Davis, San Francisco, Calif.
- Easich & Co., Los Angeles, Cal.
- Knickerbocker Co., Jackson, Mich.
- Meill-Blumberg Co., New Holstein, Wis.
- Standard Scale & Sup. Corp., Pittsburgh
- Talbot-Flood Mfg. Co., Kansas City, Mo.

MORTAR BOXES

- Blaw-Knox Co., Pittsburgh, Pa.
- General Wheelbarrow Co., Cleveland, Ohio
- Holtzel St. Form & Ir. Co., Warren, Ohio
- Jos. Henhorst Co., Cincinnati, Ohio
- Anchor Mfg. Co., Chicago, Ill.
- Beatrice Steel Tank Mfg. Co., Beatrice, Neb.
- Canton Art Metal Co., Canton, Ohio
- Donley Bros. Co., Cleveland, O.
- Empire Metal Tank Wks., E. Rochester, N. Y.
- Norris K. Davis, San Francisco, Calif.
- Littleford Bros., Cincinnati

MOTORCYCLES

- Cleveland Motorcycle Co., Cleveland, Ohio
- Excelsior Motor Mfg. & Supply Co., Chicago
- Harley-Davidson Motor Co., Milwaukee
- Indian Motorcycle Co., Springfield, Mass.

MOTORS, GASOLINE (See Engines, Gas and Gasolines)

MOTOR TRUCKS

- Dodge Bros., Detroit
- International Harvester Co., Chicago
- Acme Motor Truck Co., Cadillac, Mich.
- Amer.-La France & Foamite Corp., New York
- Atterbury Motor Car Co., Buffalo, N. Y.
- Autocar Co., Ardmore, Pa.
- Beasemer Motor Truck Co., Grove City, Pa.
- Brookway Motor Truck Co., Cortland, N. Y.
- Clydesdale Motor Truck Co., Clyde, Ohio
- Commence Motor Trk. Co., Ypsilanti, Mich.
- Denby Motor Truck Co., Detroit, Mich.
- Diamond T. Motor Car Co., Chicago
- Duplex Truck Co., Lansing, Mich.
- Federal Motor Truck Co., Detroit
- Ford Motor Co., Detroit
- Four Wheel Drive Auto Co., Clintonville, Wis.
- General Motors Truck Co., Chicago
- Gramm Motors, Inc., Lima, Ohio
- The Hug Co., Highland, Ill.
- Indiana Truck Corp., Marion, Ind.
- Kelly Springfield Truck & Bus Corp., Springfield, Ohio
- Larabee-Deyo Motor Tr. Co., Binghamton, N.Y.
- Laedinghaus-Espenschied Wagon Co., St. Louis
- Mack Trucks, Inc., New York
- Pierce-Arrow Motor Car Co., Buffalo
- Reo Motor Car Co., Lansing, Mich.
- Republic Truck Sales Corp., Alma, Mich.
- Relay Motors Corp., Wabash, Ind.
- Standard Motor Truck Co., Detroit
- Sterling Motor Truck Co., Milwaukee
- Stewart Motor Corp., Buffalo, N. Y.
- Toppins Trac. Truck Co., Appleton, Wis.
- Traffic Motor Tr. Co., St. Louis, Mo.
- United Motor Products Co., Grand Rapids, Mich.
- U. S. Motor Truck Co., Cincinnati, Ohio
- Laedinghaus-Espenschied Wagon Co., St. Louis
- Walter Motor Truck Co., L. I. City, N. Y.
- White Co., Cleveland, Ohio
- Yellow Truck & Coach Mfg. Co., Chicago

MOULDS, CONCRETE

- Blaw-Knox Co., Pittsburgh, Pa.
- Holtzel St. Form & Ir. Co., Warren, Ohio

MUCKING, MACHINES

- Hear Shovel Co., Duluth, Minn.

NUMBERS, HOUSE (See House Numbers)

OILS, ROAD

- Barber Asphalt Co., Philadelphia, Pa.
- Barrett Co., N. Y.
- Standard Oil Co. (Indiana), Chicago
- Standard Oil Co. (N. Y.), N. Y.
- Atl. Ref. & Asph. Corp., Philadelphia, Pa.
- Headley Good Roads Co., Philadelphia, Pa.
- Pioneer Asph. Co., Lawrenceville, Ill.
- Standard Oil Co. (La.), N. Orleans, La.
- Standard Oil Co. (N. J.), Newark, N. J.
- Texas Company, N. Y.

OXY-ACETYLENE APPARATUS

- Alex. Milburn Co., Baltimore, Md.
- Orweld Acetylene Co., Long Island City, N. Y.

PACKING, WATER PIPE

- The Leadite Co., Philadelphia, Pa.
- United Lead Company, N. Y.

PAINTING MACHINERY

- Alex. Milburn Co., Baltimore, Md.
- Binks Spray Equipment Co., Chicago
- Chicago Pneumatic Tool Co., New York
- De Vilbiss Mfg. Co., Toledo, Ohio
- Eclipse Air Brush Co., Newark, N. J.
- W. N. Matthews Corp., St. Louis
- Pasche Air Brush Co., Chicago
- Simons Paint Spray Brush Co., Dayton, Ohio
- Spraco Painting Equip. Co., Boston

PAINTS, METAL PROTECTION

- Barber Asphalt Co., Philadelphia
- Barrett Co., New York
- Caray Co., Philip, Cincinnati
- Jos. Dixon Crucible Co., Jersey City, N. J.
- McEverlast, Inc., Los Angeles, Calif.
- Solvay Sales Corp., New York
- Acme White Lead & Color Works, Detroit
- Berry Bros., Detroit
- Cook Paint & Varnish Co., Kansas City, Mo.
- Detroit Graphite Co., Detroit
- Detroit White Lead Works, Detroit
- E. J. De Pont de Nemours & Co., Inc., Wilmington, Del.
- Euclid Chemical Co., Cleveland, Ohio
- Hoosier Paint Works, Ft. Wayne, Ind.
- Minwax Co., N. Y.
- Protexol Corp., Kenilworth, N. J.
- Ruberoid Co., N. Y.
- Serviced Products Corp., Chicago
- Sherwin-Williams Co., Cleveland, Ohio
- L. Sonneborn Sont, N. Y.
- Tech Brothers, N. Y.
- Tropical Paint & Oil Co., Cleveland, Ohio
- Truscon Laboratories, Detroit

PARK BENCHES

- Logan Co., Louisville, Ky.
- Fred J. Meyer Mfg. Co., Hamilton, Ohio
- Milleraville Supply Co., Milleraville, Pa.
- Stewart Iron Works Co., Cincinnati, Ohio
- Van Durn Iron Works Co., Cleveland

PAVEMENT BREAKERS (See Breakers)

PAVERS, CONCRETE

- Chain Belt Co., Milwaukee
- Jaeger Mach. Co., Columbus, Ohio
- Koshring Co., Milwaukee
- Lakewood Eng. Co., Cleveland, Ohio
- Ransome Conc. Mch'y. Co., Danellen, N. J.
- Foots Co., Nunda, N. Y.
- T. L. Smith Co., Milwaukee

PAVING AND ROAD ROLLERS (See Road and Paving Rollers)

PAVING BLOCKS, CREOSOTED WOOD (See Creosoted Blocks)

PAVING BRICK

- Alton Brick Co., Alton, Ill.
- Backeye Shale Brick Co., Cleveland, Ohio
- Buffalo Brick Co., Buffalo, Kans.
- Cleveland Brick & Clay Co., Cleveland, Ohio
- Collinwood Shale Brick Co., Cleveland, Ohio
- Corry Brick & Tile Corp., Corry, Pa.
- Crescent Brick Co., Pittsburgh, Pa.
- Euclid Shale Brick Co., Cleveland, Ohio
- Georgia Vit. Brick Co., Augusta, Ga.
- Globe Brick Co., E. Liverpool, Ohio
- Hammond Fire Brick Co., Fairmount, W. Va.
- Haysylvania Coal Co., Columbus, Ohio
- Hocking Valley Brick Co., Columbus, Ohio
- McAvoy Brick Co., Bridgeville, Pa.
- Mayer Brick Co., Bridgeville, Pa.
- Metropolis Paving Brick Co., Pittsburgh, Kans.
- Metropolitan Paving Brick Co., Canton, Ohio
- Mineral Wells Brick Co., Mineral Wells, Tex.
- Moberly Paving Brick Co., Moberly, Mo.
- Murphysboro Paving Brick Co., Murphysboro, Ill.
- Nelson Brick Co., Nelsonville, Ohio
- Nelsonville Brick Co., Columbus, Ohio
- Patton Clay Mfg. Co., Patton, Pa.

- Parton Brick Co., Watsontown, Pa.
- Peabees Paving Brick Co., Portsmouth, Ohio
- Peoria Brick & Tile Co., Peoria, Ill.
- Purinton Paving Brick Co., Galesburg, Ill.
- Rose Shale Brick Co., Veedersburg, Ill.
- Russell Clay Mfg. Co., Alton, Ala.
- So. Clay Mfg., Chattanooga, Tenn.
- Springfield Paving Brick, Springfield, Ill.
- Sterling Brick Co., Olean, N. Y.
- Streator Clay Mfg. Co., Streator, Ill.
- Terre Haute Vit. Brick Co., Terre Haute, Ind.
- Thornton Fire Brick Co., Clarksburg, W. Va.
- Thurber Brick Co., Thurber, Tex.
- Toronto Fire Clay Co., Toronto, Ohio
- Trinidad Brick & Tile Co., Trinidad, Ohio
- United Clay Products Corp., Kansas City
- Western Shale Products Co., Ft. Scott, Kans.
- Westport Paving Brick Co., Westport, Md.

PAVING MACHINERY (See Road and Paving Machinery)

PAVING GUARDS, STEEL

- W. S. Godwin Co., Baltimore, Md.

PAVING MATERIALS (See "Asphalt," "Paving Brick," "Granite Block," etc.)

PAVING MIXERS (See Concrete Mixers)

PAVING TOOLS

- Barber Asphalt Co., Philadelphia, Pa.
- Chausse Oil Burner Co., Elkhart, Ind.
- Conners & Co., Philadelphia, Pa.
- Jos. Henhorst Co., Cincinnati, Ohio
- Union Iron Works, Inc., Hoboken, N. J.
- Warren Bros. Co., Boston
- Aeroll Burner Co., West New York, N. J.
- W. H. Anderson Tool & Supply Co., Detroit
- F. D. Cummer & Sons Co., Cleveland, Ohio
- Hauck Mfg. Co., Brooklyn, N. Y.
- Littleford Bros. Co., Cincinnati, Ohio

PICKS

- Hubbard Co., Pittsburgh, Pa.
- Iron City Tool Works, Pittsburgh
- Klein-Logan Co., Pittsburgh
- Oliver Iron & Steel Corp., Pittsburgh, Pa.
- Verona Tool Works, Verona, Pa.
- Warren Tool & Forge Co., Warren, Ohio
- Warwood Tool Co., Wheeling, W. Va.
- Wyoming Shovel Works, Wyoming, Pa.

PILE DRIVERS

- Brown Clutch Co., Sandusky, Ohio
- Bucyrus-Erie Co., Erie, Pa.
- Clyde Iron Works Sales Co., Duluth, Minn.
- Industrial Brownhoist Corp., Cleveland
- Lidgerwood Mfg. Co., Elizabeth, N. J.
- McKiernan-Terry Drill Co., N. Y.
- Union Iron Works, Inc., Hoboken, N. J.
- McMyler Interstate Co., Cleveland, Ohio
- Mead-Morrison Mfg. Co., East Boston

PILE-HAMMERS, STEAM

- Clyde Iron Works Sales Co., Duluth, Minn.
- Industrial Brownhoist Corp., Cleveland
- McKiernan-Terry Drill Co., N. Y.
- Union Iron Works, Inc., Hoboken, N. J.
- Wemlinger, Inc., N. Y.
- National Hoisting Engine Co., Harrison, N. J.
- Vulcan Iron Works, Chicago

PILING, CONCRETE

- MacArthur Conc. Pile & F'd'n Co., N. Y.
- Raymond Concrete Pile Co., N. Y.

PILING, INTERLOCKING STEEL

- Wemlinger, Inc., New York
- Bethlehem Steel Co., Bethlehem, Pa.
- Carnegie Steel Co., Pittsburgh

PILING, STEEL SHEET

- Wemlinger, Inc., New York
- Bethlehem Steel Co., Bethlehem, Pa.

PIPE, CAST IRON

- Central Foundry Co., N. Y.
- U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.
- Am. Cast Iron Pipe Co., Birmingham, Ala.
- J. B. Clow & Sons, Chicago
- Donaldson Iron Co., Emsas, Pa.
- John Fox & Co., N. Y.
- Glamorgan Pipe & F'dry Co., Lynchburg, Va.
- Lynchburg F'dry Co., Lynchburg, Va.
- McWane Cast Iron Pipe Co., Birmingham, Ala.
- National Cast Iron Pipe Co., Birmingham, Ala.
- Warren Foundry & Pipe Co., N. Y.
- R. D. Wood & Co., Philadelphia, Pa.

PIPE, CULVERT (See Culverts)

**"For accuracy of spacing
and speed of driving
on submarine work—give me**

McKiernan-Terry PILE HAMMERS



"Much better results were obtained with the submarine hammer than could have been obtained by other methods, due to the accuracy of spacing and speed of driving, as no followers or jet were required."

That is what the Contractor on the Flushing Creek Bridge said about his McKiernan-Terry 11-B-2. The job included driving some 1,300 spruce piles, 20 to 35 feet long. It was very hard driving. The 11-B-2, working under water, averaged 85 piles per 8-hour shift.

The McKiernan-Terry book on pile driving contains a hundred interesting job pictures of this kind—large, clear pictures, with accompanying brief descriptions of the work. All kinds of pile driving and pulling are included, from the heaviest concrete monoliths to the lightest steel and wood sheeting. There are also several pictures of demolition work done with McKiernan-Terry Pile Hammers—a comparatively new use for these versatile machines. This McKiernan-Terry Bulletin has been referred to as a textbook on pile driving. Instead of making claims for McKiernan-Terry Pile Hammers, it simply shows what they are doing for leading contractors throughout the world.

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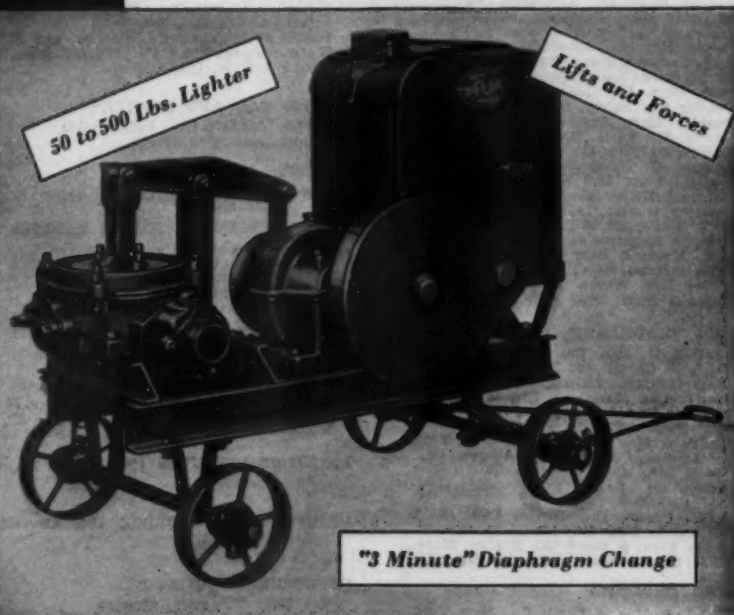
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500 gallon

600 gallon

Adaptable to mounting on any standard truck chassis of sufficient capacity equipped with power take-off attachment.

Ask for Bulletin KCO

At Left—CHAMPION COLD OIL DISTRIBUTOR ON GRAHAM 3-Ton High Speed Chassis—Model RES.

CHAMPION BITUMINOUS DISTRIBUTORS (Heater Type)

Champion Bituminous Distributors are especially designed and constructed for the application of the heavy asphalts and tars, where heating of the material and its application under pressure is necessary.

Built in three standard sizes, 600-, 800-, and 1000-gallon tank capacity. Single or double unit type. Adaptable to mounting on any standard truck chassis of sufficient capacity.

CHAMPION DISTRIBUTORS possess many features that will be appreciated by the users of such equipment. Catalog KBD describes them in detail, and contains much useful data. Ask for it.



Above—CHAMPION BITUMINOUS DISTRIBUTOR—Model Y-79 Type PT. on MACK TRUCK—(Single Unit Machine)

SALES BRANCHES

PHILADELPHIA

WATERTOWN, MASS.

NEW YORK

PITTSBURGH

CHICAGO

LOS ANGELES

DISTRIBUTORS IN PRINCIPAL WESTERN CITIES



Where to Purchase

ROPE, MANILA

American Mfg. Co., Brooklyn, N. Y.
Columbian Rope Co., Auburn, N. Y.
Opples Cordage Co., Brooklyn, N. Y.
Hooven & Allison Co., Xenia, O.
R. A. Kelly Co., Xenia, O.
N. Bedford Cordage Co., N. Bedford, Mass.
Leoria Cordage Co., Peoria, Ill.
Plymouth Cordage Co., N. Plymouth, Mass.
Portland Cordage Co., Portland, Ore.
St. Louis Cordage Mills, St. Louis, Mo.
Tubbs Cordage Co., San Francisco
Wall Rope Works, New York
Waterbury Co., New York
Whitlock Cordage Co., New York

ROPE, WIRE, HOISTING, HAULAGE

*American Steel & Wire Co., Chicago
*L. P. Green, Chicago
*Williamsport Wire Rope Co., Williamsport, Pa.
American Cable Co., Inc., New York
Broderick & Bascom Rope Co., St. Louis, Mo.
Fischer & Hayes Rope & Steel Co., Chicago
Hazard Wire Rope Co., Wilkesbarre, Pa.
A. Lechen & Sons Rope Co., St. Louis
Macwhysie Co., Kenosha, Wis.
J. A. Roebeling's Sons Co., Trenton, N. J.
Upson-Walton Co., Cleveland, Ohio
Wickwire Spencer Steel Co., New York

RUBBER TIRES (See Tires)

SALAMANDERS, OIL BURNING

*Aeroll Burner Co., West New York, N. J.
Hauk Mfg. Co., Brooklyn, N. Y.
Littleford Brothers, Cincinnati, Ohio

SALAMANDERS, COKE OR WOOD BURNING

*General Wheelbarrow Co., Cleveland, Ohio
*Joseph Horvath Co., Cincinnati, Ohio
Jackson Mfg. Co., Harrisburg
Littleford Brothers, Cincinnati, Ohio

SAFETY TREADS (See Treads, Safety)

BASH ROLLER STEEL (See Window Frames and Bash)

SAW HORSES

Everhot Mfg. Co., Maywood, Ill.

SAW MILLS & ACCESSORIES

*American Saw Mill Machy. Co., Hackettstown, N. J.

SAW RIGS, PORTABLE

*American Saw Mill Machy. Co., Hackettstown, N. J.
*C. H. & B. Mfg. Co., Milwaukee
*John Lauen Mfg. Co., New Holstein, Wis.
Beach Mfg. Co., Montross, Pa.
De Walt Products Co., Leola, Pa.
Jones Superior Machine Co., Chicago
Knickerbocker Co., Jackson, Mich.
Leach Co., Oshkosh, Wis.
Witte Engine Works, Kansas City, Mo.

SAWS, PORTABLE POWER

*Tousley Tool Co., Cleveland, Ohio
Electric-Magneto Tool Co., Chicago
Flexway Corp., Cincinnati, Ohio
Ingersoll-Rand Co., New York
Michel Electric Hand Saw Co., Chicago
Foster Cable Machinery Co., Syracuse
Reed-Prentice Corp., Worcester, Mass.
F. L. Rogers & Co., Chicago
Skilaw, Inc., Chicago, Ill.
Wappat Gear Works, Pittsburgh, Pa.
Witte Engine Works, Kansas City, Mo.

SCARIFIERS

*Austin-Western Road Machinery Co., Chicago
*Barber Asphalt Co., Philadelphia
*Buffalo-Springfield Roller Co., Springfield, O.
*Good Roads Machy. Co., Kennett Sq., Pa.
*Huber Mfg. Co., Marion, Ohio
Acme Road Machinery Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Bantling Mfg. Co., Toledo, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Gallon Iron Works & Mfg. Co., Gallon, O.
Klauer Mfg. Co., Dubuque, Iowa
Rome Mfg. Co., Rome, N. Y.
Russell Grader Mfg. Co., Minneapolis
Universal Road Machy. Co., Kingston, N. Y.

SCARIFIERS, TRENCH FOR

Gallon Iron Works & Mfg. Co., Gallon, Ohio
Russell Grader Mfg. Co., Minneapolis
Shank Mfg. Co., Bucyrus, Ohio

SCOOPS, HORSE OR TRACTOR DRAWN (See Scrapers Drag, Scrapers, Rotary and Scrapers, Wheeled)

SCOOPS, HAND (See Shovels, Spades and Scoops)

SCOOPS, SKIDDER AND TRENCH

*Bay City Shovels, Inc., Bay City, Mich.
Keystone Driller Co., Beaver Falls, Pa.

SCRAPERS, DRAG

*Austin-Western Road Machinery Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
Chattanooga Wheelbr Co., Chattanooga, Tenn.
Deere & Co., Moline, Ill.
Donaldson Bros. Mfg. Co., Chicago, Mich.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Gallon Iron Works & Mfg. Co., Gallon, Ohio
Jackson Mfg. Co., Harrisburg, Pa.
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
Stockland Road Machinery Co., Minneapolis
Toledo Wheelbarrow Co., Toledo, Ohio
Western Wheeled Scraper Co., Aurora, Ill.

SCRAPERS, FRESNO (See Scrapers, Rotary)

SCRAPERS, DRAGLINE

*General Wheelbarrow Co., Cleveland
*Garst Mfg. Company, Chicago
*Sauerman Bros., Chicago
Beach Mfg. Co., Charlotte, Mich.
Link-Belt Co., Chicago
Russell Grader Mfg. Co., Minneapolis

SCRAPERS, POWER DRAG

*Beaumont Manufacturing Co., Philadelphia
*Garst Mfg. Company, Chicago
*L. P. Green, Chicago
*W. A. Riddell Co., Bucyrus, Ohio
*Sauerman Bros., Chicago
Beach Mfg. Co., Charlotte, Mich.
General Wheelbarrow Co., Cleveland
Russell Grader Mfg. Co., Minneapolis

SCRAPERS, ROAD (See also Drags, Road)

Rome Mfg. Co., Rome, N. Y.
Root Spring Scraper Co., Kalamazoo, Mich.

SCRAPERS, ROTARY

*Austin-Western Road Machinery Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Caterpillar Tractor Co., San Leandro, Calif.
*Euclid Crane & Hoist Co., Euclid Village, O.
*Killefer Mfg. Co., Los Angeles, Calif.
*Roderick Lean Co., Mansfield, Ohio
*Gustav Schaefer Co., Cleveland, Ohio
Adams & Co., J. D., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Atlas Scraper Co., Los Angeles, Calif.
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Gallon Iron Works & Mfg. Co., Gallon, O.
H. C. Shaw Co., Stockton, Calif.
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
Solano Iron Works, Berkeley, Calif.
Stockland Road Machy. Co., Minneapolis, Minn.
General Wheelbarrow Co., Cleveland, Ohio
Lyle Culvert & Road Equip. Co., Minneapolis
Miskin Scraper Works, Ucon, Idaho
Root Spring Scraper Co., Kalamazoo
Sidney Steel Scraper Co., Sidney, O.
Stockland Road Machinery Co., Minneapolis
Western Wheeled Scraper Co., Aurora, Ill.

SCRAPERS, SELF-LOADING (See Scrapers, Rotary and Scrapers, Wheeled)

SCRAPERS, WHEELED

*Austin-Western Road Machinery Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Caterpillar Tractor Co., San Leandro, Calif.
*Euclid Crane & Hoist Co., Euclid Village, O.
*General Wheelbarrow Co., Cleveland
*W. A. Riddell Co., Bucyrus, Ohio
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Atlas Scraper Co., Los Angeles, Calif.
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Gallon Iron Works & Mfg. Co., Gallon, Ohio
LaPlant-Cheats Mfg. Co., Cedar Rapids, Iowa
Miami Trailer Scraper Co., Troy, Ohio
Miskin Scraper Wks., Ucon, Ia.
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
H. C. Shaw Co., Stockton, Calif.
Stockland Road Machy. Co., Minneapolis, Minn.
Western Wheeled Scraper Co., Aurora, Ill.

SCREENS, SAND, GRAVEL AND COAL

*Austin-Western Road Machinery Co., Chicago
*Chain Belt Co., Milwaukee, Wis.
*Chicago Automatic Conv. Co., Chicago
*Good Roads Machinery Co., Kennett Sq., Pa.
*L. P. Green, Chicago
*Geo. Halse Mfg. Co., New York
Acme Road Machinery Co., Frankfort, N. Y.
Atlas-Chalmers Mfg. Co., Milwaukee
Atlas Engineering Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago
C. O. Barlett & Son Co., Cleveland, Ohio
Beach Mfg. Co., Charlotte, Mich.
Brown Hoisting Machy. Co., Cleveland, Ohio

Deister Concentrator Co., Ft. Wayne, Ind.
Gallon Iron Works & Mfg. Co., Gallon, Ohio
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Ohio
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
Littleford Bros., Cincinnati, Ohio
Lyle Culvert & Road Equipment Co., Minneapolis, Minn.
Morrow Mfg. Co., Wellston, Ohio
Newago Engineering Co., Newago, Mich.
New Holland Machy. Co., New Holland, Pa.
New Jersey Wire Cloth Co., Trenton, N. J.
Robins Conv. Belt Co., New York
Russell Grader Mfg. Co., Minneapolis
H. B. Sackett Screen & Chute Co., Chicago
Smith Engineering Works, Milwaukee, Wis.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Machine Co., Kingston, N. Y.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
Wickwire Spencer Steel Co., New York

SCREENS, SEWAGE

Dorr Co., New York
Green Bay Fdry. & Mach. Wks., Green Bay, Wis.
Link-Belt Co., Chicago
Simplex Ejector & Aerator Corp., Chicago

SEWAGE DISINFECTION

*Wallace & Tiernan Co., Inc., Newark, N. J.

SEWAGE DISPOSAL APPARATUS

Dorr Co., New York
Link-Belt Co., Chicago
Pacific Flush Tank Co., Chicago and N. Y.
Simplex Ejector & Aerator Corp., Chicago

SEWAGE EJECTORS

Pacific Flush Tank Co., Chicago and N. Y.
Simplex Ejector & Aerator Corp., Chicago
Yeomans Bros. Co., Chicago

SEWAGE PUMPS (See Pumps)

SEWER BLOCKS, SEGMENT

American Vit. Products Co., Akron, Ohio
Cannellton Sewer Pipe Co., Cannellton, Ind.
Denver Sewer Pipe & Clay Co., Denver, Col.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evans & Howard Fire Brick Co., St. Louis, Mo.
Laclede Christy Clay Prod. Co., St. Louis, Mo.
Macomb Sewer Pipe Works, Macomb, Ill.
Pacific Clay Products Co., Los Angeles, Cal.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Products Co., Akron, Ohio
Standard Fire Brick & Sewer Pipe Co., Pueblo, Col.

SEWER BRACES

*Templeton, Kenly & Co., Chicago

SEWER CLEANING APPARATUS

F. Bissell Co., Toledo, Ohio
Champion Corp., Hammond, Ind.
Heppo Sewer Root Cutter Co., Freeport, Ill.
Self Propelling Nozzle Co., New York
Turbine Sewer Machine Co., Milwaukee

SEWER PIPE AND DRAIN TILE

American Vit. Products Co., Akron, Ohio
Blackmer & Post Pipe Co., St. Louis
William E. Dee Co., Chicago
Denver Sewer Pipe & Clay Co., Denver, Colo.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evans & Howard Fire Brick Co., St. Louis
Logan Clay Products Co., Logan, Ohio
Ohio Vit. Pipe Co., Uhrichsville, Ohio
Patton Clay Mfg. Co., Patton, Pa.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Prod. Co., Akron, Ohio
Streator Clay Mfg. Co., Streator, Ill.

SEWER PIPE FORMS (See Forms, Concrete Pipe)

SEWER PIPE JOINT COMPOUNDS

Atlas Mineral Prod. Co., Meristown, Pa.
Pacific Flush Tank Co., Chicago and N. Y.
Ruberoid Co., New York
Servicised Products Corp., Chicago
Conc. Form Co., Inc., Syracuse, N. Y.
Quinn Wire & Iron Works, Boone, Iowa

SEWER RODS

F. Bissell Co., Toledo, Ohio
Champion Corp., Hammond, Ind.
Turbine Sewer Machine Co., Milwaukee

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*



ELECTRIC STEEL CASTINGS



**CASTINGS OF THE
HIGHEST MERIT—**

The seller of this bucket tells the buyer of such equipment, "this bucket is guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—or

—WRITE YOUR OWN GUARANTEE!

Could a statement more frank, and to the point,

**—FOR A BUCKET OF
THE HIGHEST MERIT**

be made to express the utmost confidence in the superiority of the design or the material used in the construction of his product?

It is interesting to note that FARRELL-CHEEK Steel Castings make up the main parts of this bucket. Head—corner brackets—hinges—lips.

**IF YOU DESIRE CASTING SATISFACTION—
HAVE THEM MADE THE FARRELL-CHEEK WAY!**

The Farrell-Cheek Steel Foundry Company., Sandusky, Ohio

NEW YORK OFFICE: 25 Church Street

BIRMINGHAM OFFICE: 2124 Highland Avenue

PHILADELPHIA OFFICE: 2401 Chestnut Street



Where to Purchase

SHARPENERS, DRILL STEEL

*Sullivan Machinery Co., Chicago
Gardner-Denver Co., Quincy, Ill.
Hardscull Wonder Drill Co., Ottumwa, Iowa
Ingersoll-Rand Co., New York

SHORES

Concrete Engineering Co., Omaha, Neb.
Dayton Sore Grip & Shore Co., Dayton, Ohio
Fischer & Hayes Rope & Steel Co., Chicago
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
H. W. Ross Co., Cincinnati, Ohio
Ross-Meyer-Hecht Co., Cincinnati, Ohio
Symons Clamp & Mfg. Co., Chicago
Universal Form Clamp Co., Chicago

SHOVELS, CRAWLING TRACTOR

*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*The Shovel Co., Lorain, Ohio
*Trackcon Co., Milwaukee
American Hoist & Derrick Co., St. Paul
Ohio Power Shovel Co., Lima, O.
Speeder Mch. Corp., Cedar Rapids, Iowa

SHOVELS, ELECTRIC

*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*The Shovel Co., Lorain, Ohio
American Hoist & Derrick Co., St. Paul
Byers Mach. Co., Ravenna, Ohio
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, Ohio
Ohio Power Shovel Co., Lima, O.
Speeder Mch. Corp., Cedar Rapids, Iowa

SHOVELS, GASOLINE

*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Inley Mfg. Co., Indianapolis
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*The Shovel Co., Lorain, Ohio
*Trackcon Co., Milwaukee
American Hoist & Derrick Co., St. Paul
American Steel Dredge Co., Ft. Wayne, Ind.
Austin Machine Corp., Muskegon, Mich.
Byers Mach. Co., Ravenna, Ohio
General Excavator Co., Marion, Ohio
Harnischfeger Corp., Milwaukee, Wis.
Keystone Driller Co., Beaver Falls, Pa.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, Ohio
McKylar Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., Boston
Northwest Engineering Works, Chicago
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Speeder Mch. Corp., Cedar Rapids, Iowa
Star Drilling Machine Co., Akron, Ohio
Universal Power Shovel Co., Highland Park, Mich.

SHOVELS, STEAM

*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Osgood Company, Marion, Ohio
*The Shovel Co., Lorain, Ohio
American Hoist & Derrick Co., St. Paul
Marion Steam Shovel Co., Marion, Ohio
Orton Crane & Shovel Co., Chicago
Keystone Driller Co., Beaver Falls, Pa.

SHOVELS, SPADES AND SCOOPS

American Mfg. Co., Chattanooga, Tenn.
Ames Shovel & Tool Co., Boston
Baldwin Tool Works, Parkersburg, W. Va.
Beall Bros. Co., Alton, Ill.
Conneaut Shovel Co., Conneaut, Ohio
Hubbard & Co., Pittsburgh, Pa.
Indiana Shovel Co., New Castle, Ind.
Jackson Shovel Co., Montpelier, Ind.
Pittsburgh Shovel Co., Pittsburgh, Pa.
Russell Shovel Co., Aliquippa, Pa.
Stevens-Webb Co., Inc., Altoona, Pa.
Union Furnace Mfg. Co., Altoona, Pa.
Wood Shovel & Tool Co., Piqua, Ohio
Wyoming Shovel Works, Wyoming, Pa.

SIDEWALK AND ROAD FORMS (See Forms, Concrete)

SIGNS, STREET AND ROAD

Alumond Sign & Signal Co., Chicago
Auto Sign Display Co. of Missouri, St. Louis, Mo.
Baltimore Enamel & Novelty Co., Baltimore
Elkhart Foundry & Machine Co., Elkhart, Ind.
Everan-Century Sign Co., Boston
Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
A. D. Joslin Mfg. Co., Manistee, Mich.
Lyle-Signs, Minneapolis, Minn.
Municipal Street Sign Co., New York
Niles Machine Co., Lebanon, N. H.
Redflex Signal Co., Cleveland, Ohio

Rochester Street Signal Co., Rochester, N. Y.
Standard Mfg. Co., Cedar Falls, Iowa
Union Iron Products Co., E. Chicago, Ind.
Western Stamping & Mfg. Co., St. Paul

SLEEVES, TAPPING AND VALVE

Mueller Company, Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
A. F. Smith Mfg. Co., East Orange, N. J.

SLUICE GATES (See Gates, Sluice)

SMOKE STACKS (See Chimneys, Steel)

SNOW REMOVAL MACHINERY

*Austin-Western Road Machinery Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Barber-Greene Co., Aurora, Ill.
*Caterpillar Tractor Co., San Leandro, Cal., and Peoria, Ill.
*Cleveland Tractor Co., Cleveland, Ohio
*Good Roads Machinery Co., Kennett Sq., Pa.
*George Hains Mfg. Co., New York
*Killefer Mfg. Co., Los Angeles, Calif.
*W. A. Middel Co., Bucyrus, Ohio
*Trackcon Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago
Byers Mach. Co., Ravenna, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Fox Rotary Snow Broom Co., New York
Carl H. Frink, Thousand Islands, N. Y.
The Hell Company, Milwaukee, Wis.
Klauer Mfg. Co., Dubuque, Iowa
LaPlant-Chaste Mfg. Co., Cedar Rapids, Iowa
Mack Trucks, Inc., New York
Maine Steel Products Co., So. Portland, Me.
Mead-Morrison Mfg. Co., E. Boston
Monarch Tractors Corp., Springfield, Ill.
N. P. Nelson Co., Passaic, N. J.
New England Road Machy. Co., So. Boston, Mass.
Owensboro Ditcher & Grader Co., Owensboro, Ky.
Rotary Snow Plow Co., Minneapolis
Russell Grader Mfg. Co., Minneapolis
Walsh's Holyoke St. Bldg. Works, Holyoke, Mass.
Walter Snow Fighters, L. I. City, N. Y.
Wausau Iron Wks., Wausau, Wis.

SNOW FENCING

*Good Roads Machinery Co., Kennett Sq., Pa.
American Fence Const. Co., New York
Wickwire-Spencer Steel Co., New York

SPADES (See Shovels)

SPRAYERS, ASPHALT AND TAR

Kinney Mfg. Co., Boston
Littleford Bros., Cincinnati

SPRAYING MACHINERY FOR TREES

John Bean Mfg. Co., Lansing, Mich.
Daming Co., Salem, Ohio
Field Force Pump Co., Elmira, N. Y.
Pittsberry-Guptill Co., E. Cambridge, Mass.
Friend Mfg. Co., Gasport, N. Y.
Hardie Mfg. Co., Hudson, Mich.

SPRAY PAINTING MACHINERY (See Painting Machinery)

SPREADERS, SAND

*Good Roads Machy. Co., Kennett Square, Pa.
*Warren Bros. Co., Boston, Mass.
Goroco Mechanical Spreader Co., Philadelphia
Highway Service Co., New Bedford, Mass.
Tarrant Co., Saratoga Springs, N. Y.

SPREADERS, STONE

*Austin-Western Road Machinery Co., Chicago
*The Burch Corp., Crestline, Ohio
Gallon Iron Works & Mfg. Co., Gallon, Ohio
Shaw-Enoch Tractor Co., Minneapolis
Universal Road Machinery Co., Kingston, N. Y.

STACKS, STEEL

*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Inc., Philadelphia
*Holtel Steel Form & Iron Co., Warren, Ohio
*Joseph Henrichs Co., Cincinnati, Ohio
Birmingham Tank Co., Birmingham, Ala.
Canton Art Metal Co., Canton, Ohio
Chattanooga Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Graver Corp., Chicago
Hedges-Walsh-Weidner Co., Chattanooga, Tenn.
Heli Co., Milwaukee, Wis.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
New York Central Iron Works Co., Inc., Hagerstown, Md.
Tippett & Wood, Phillipsburg, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
W. B. Seale & Sons, Pittsburgh, Pa.

STANDPIPES AND ELEVATED TANKS

W. E. Caldwell Co., Louisville, Ky.
Chatta. Bldg. & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
R. D. Cole Mfg. Co., Newnan, Ga.
Hedges-Walsh-Weidner Co., Chattanooga, Tenn.
Lancaster Iron Works, Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
J. R. Schofield's Sons Co., Macon, Ga.
Tippett & Wood, Phillipsburg, Pa.
United Iron Works, Inc., Kansas City, Mo.

STEAM SHOVELS (See Shovels, Steam)

STEEL PLATE CONSTRUCTION

*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Philadelphia
*Holtel Steel Form & Iron Co., Warren, Ohio
*Joseph Henrichs Co., Cincinnati, Ohio
*Union Iron Works, Hagerstown, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Graver Corp., East Chicago, Ill.
Hedges-Walsh-Weidner Co., Chattanooga, Tenn.
Heli Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
McIntire-Marshall Co., Pittsburgh, Pa.
New York Central Iron Works Co., Inc., Hagerstown, Md.
Pennsylvania Bridge Co., Beaver Falls, Iowa
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Ritter-Conley Co., Pittsburgh, Pa.
W. B. Seale & Sons, Pittsburgh, Pa.

STEEL SHEET PILING

*Wemlinger, Inc., New York

STEEL TOWERS, CONCRETE

*Inley Mfg. Co., Indianapolis, Ind.
*Lakewood Engr. Co., Cleveland, O.
*Ransome Const. Machinery Co., Dunellen, N. J.

STOKERS, MECHANICAL

Babcock & Wilcox Co., New York
Combustion Engineering Corp., New York
Dayton Stoker Co., Dayton, Ohio
Detroit Stoker Co., Detroit
Green Eng. Co., East Chicago, Ind.
Sanford Riley Stoker Co., Worcester, Mass.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

STREET AND ROAD SIGNS (See Signs)

STREET BROOMS

Kendallville Broom & Brush Co., Kendallville, Ind.
Joseph Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, Ohio

STREET CLEANERS' CARTS

Durlach Can & Iron Works, Brooklyn, N. Y.
Rochester Can Co., Rochester, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.

STREET FLUSHERS AND SPRINKLERS

*Austin-Western Road Mch. Co., Chicago
*Whitehead & Kales Co., Detroit
Austin Mfg. Co., Chicago
Autocar Co., Ardmore, Pa.
E. D. Etnyre & Co., Oregon, Ill.
Federal Motor Truck Co., Detroit
Gallon Iron Works & Mfg. Co., Gallon, Ohio
General Motors Truck Co., Chicago
Heli Co., Milwaukee, Wis.
Charles Hyatt & Co., New York
Kinney Mfg. Co., Boston
Mack Trucks, Inc., New York
Municipal Supply Co., South Bend, Ind.
White Co., Cleveland, Ohio

STREET LIGHTING EQUIPMENT

*Novo Engine Co., Lansing, Mich.
American Const. Prod. Co., Forest Park, Ill.
Chicago Const. Prod. Co., Chicago
J. B. Clow & Sons, Chicago
Electric Ry. Equipment Co., Cincinnati, Ohio
Holophane Co., New York
Kline Mfg. Co., Chicago
Lins Material Co., So. Milwaukee, Wis.
J. R. Schofield's Sons Co., Macon, Ga.
Union Metal Mfg. Co., Canton, Ohio
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

STREET SIGNS (See Signs, Street)



The Osgood $\frac{3}{4}$ yard steamers and one Osgood $1\frac{1}{4}$ Yard heavy Duty Gas Shovel on the job.

3

Excavating for the New \$6,000,000.00 Court House at Denver, Colo. S.M. & S.J. Feely, Contractors.

OSGOOD'S ON THE NEW DENVER COURT HOUSE JOB

Repeat Orders mean satisfied customers
Satisfied customers make a profit moving dirt
Osgoods Repeat

THE  **OSGOOD** CO.
MARION OHIO.

Where to Purchase

STREET SWEEPERS

*Austin-Western Road Mch. Co., Chicago
*Whitehead & Kales Co., Detroit
Acme Road Mch. Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Butler Mfg. Co., Cleveland, Ohio
Elgin Sales Corp., New York
Kinney Mfg. Co., Boston

STREET SWEEPER BROOMS REFILLED

Kendallville Broom & Brush Co., Kendallville, Ind.
Joseph Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, Ohio
Standard Brush & Broom Mfg. Co., Chicago

STUMP PULLERS

*Bees Bros., Inc., Seattle, Wash.
H. L. Bennett & Co., Westerville, Ohio
Eratid Mfg. Co., Portland, Ohio
LaPlant-Chaste Mfg. Co., Cedar Rapids, Iowa
John Waldron Corp., New Brunswick, N. J.

SUBGRADING MACHINES

*Blaw-Knox Co., Pittsburgh, Pa.
*Keesring Co., Milwaukee
*Lakewood Eng. Co., Cleveland, Ohio
*Ted Carr & Co., Chicago
The Hug Co., Highland, Ill.
Shaw-Enochs Tractor Co., Minneapolis

SURFACERS & GRINDERS, CONCRETE

*Concrete Surfacing Machy. Co., Cincinnati
*Tousley Tool Co., Cleveland
Chicago Pneumatic Tool Co., New York
Cleveland Pneumatic Tool Co., Cleveland
The Dallett Co., Philadelphia
Ingersoll-Rand Co., New York

SURVEYORS' INSTRUMENTS (See Instruments)

SWITCHBOARDS

Allis-Chalmers Mfg. Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Wagner Electric Mfg. Co., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TAMPERS, PNEUMATIC

*Independent Pneumatic Tool Co., Chicago, Ill.
Chicago Pneumatic Tool Co., New York
Ingersoll-Rand Co., New York

TAMPING MACHINES, CONCRETE BLOCK

*Cement Block Machinery Co., Newark, N. J.
Zagelmeyer Cast Stone Block Mch. Co., Bay City, Mich.

TANKS, AIR COMPRESSOR

*Canary & Co., Inc., Philadelphia
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Chicago Bridge & Iron Works, Chicago
Chicago Pneumatic Tool Co., New York
Curtis Pneu. Mch. Co., St. Louis, Mo.
Graver Corp., East Chicago, Ind.
Heil Co., Milwaukee, Wis.
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Nagle Engine & Boiler Works, Erie, Pa.
National Tube Co., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
W. B. Seale & Sons, Pittsburgh, Pa.
Westinghouse Tract. Brakes Co., Wilmerding, Pa.
Worthington Pump & Mch. Co., New York

TANKS, STEEL

*Columbian St. Tank Co., Kansas City, Mo.
*Canary & Co., Philadelphia
*Joseph Henshorst Co., Cincinnati, Ohio
Bauman Mfg. Co., Millersville, Pa.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
Butler Mfg. Co., Minneapolis, Minn.
J. I. Case Threshing Machine Co., Racine, Wis.
W. E. Caldwell Co., Louisville, Ky.
Canton Art Metal Co., Canton, Ohio
Chattanooga Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Dover Boiler Works, New York
Edwards Mfg. Co., Cincinnati, O.
Farrell Mfg. Co., Joliet, Ill.
C. C. Fouts Co., Middletown, Ohio
Graver Corp., E. Chicago, Ind.
R. Hardisty Mfg. Co., Denver, Colo.
Hedges-Walsh-Weldner Co., Chattanooga, Tenn.
Heil Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Nagle Eng. & Boiler Works, Erie, Pa.
New York Central Iron Works Co., Hagerstown, Md.
Pacific Tank & Pipe Co., San Francisco
Petroleum Iron Works Co., Sharon, Pa.

Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Ritter-Conley Co., Pittsburgh, Pa.
W. B. Seale & Sons, Pittsburgh
United Iron Works, Inc., Kansas City, Mo.

TANKS, WOOD

W. E. Caldwell Co., Louisville, Ky.
G. M. Davis & Son, Palatka, Fla.
Eagle Tank Co., Chicago
Hauser-Stander Tank Co., Cincinnati, Ohio
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
National Tank & Pipe Co., Portland, Ore.
Pacific Tank & Pipe Co., San Francisco
Redwood Mfrs. Co., San Francisco
A. T. Searns Lumber Co., Boston
U. S. Wind Eng. & Pump Co., Batavia, Ill.
Wendnagel & Co., Chicago

TAPES, STEEL AND METALLIC

Eugene Dietzgen Co., New York
Kaufel & Easer Co., Hoboken, N. J.
Lufkin Rule Co., Saginaw, Mich.
The L. B. Starrett Co., Athol, Mass.

TAR

*Barrett Co., New York
American Tar Products Co., Pittsburgh, Pa.

TAR KETTLES (See Kettles)

TRAWLING OUTFITS

*Chausse Oil Burner Co., Elkhart, Ind.
Aeroll Burner Co., West New York, N. J.
Littleford Bros., Cincinnati
Hauk Mfg. Co., Brooklyn, N. Y.

TIES, STEEL

Carnegie Steel Co., Pittsburgh, Pa.
International Steel Tie Co., Cleveland, O.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TIRES, RUBBER (For Motor Trucks)

Firestone Tire & Rubber Co., Akron, O.
Fisk Tire Co., Chillicothe Falls, Mass.
Goodrich Rubber Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelly Springfield Tire Co., New York
U. S. Tire Co., New York

TOOL HOUSES, PORTABLE STEEL

*Blaw-Knox Co., Pittsburgh, Pa.
Littleford Bros., Cincinnati, Ohio

TORCHES, OIL HEATING

*Chausse Oil Burner Co., Elkhart, Ind.
*Canary & Co., Philadelphia, Pa.
*Alex. Milburn Co., Baltimore, Md.
Hauk Mfg. Co., Brooklyn, N. Y.
Hoosier Paint Works, Ft. Wayne, Ind.
Littleford Bros., Cincinnati
Mead-Morrison Mfg. Co., East Boston, Mass.
Sewall Paint & Varnish Co., Kansas City, Mo.
Sherwin-Williams Co., Cleveland, O.
Tropical Paint & Oil Co., Cleveland, O.
Truscon Laboratories, Detroit, Mich.

TORCHES, WELDING

*Toledo Pressed Steel Co., Toledo, Ohio
McCluskey Torch Co., Toledo, Ohio

TOWERS (See Standpipes and Elevated Tanks)

TRACKS, INDUSTRIAL AND PORTABLE

*Lakewood Eng. Co., Cleveland, O.
Atlas Car & Mfg. Co., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Eaton Foundry & Mfg. Co., Columbus, O.
Eaton Car & Construction Co., Easton, Pa.
C. W. Hunt Co., Inc., W. N. Brighton, N. Y.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TRACTION TRENDS (See Trends, Traction)

TRACTORS

*Atlas Engineering Co., Clintonville, Wis.
*Caterpillar Tractor Co., San Leandro, Calif.
*Cleveland Tractor Co., Cleveland, O.
*Huber Mfg. Co., Marion, O.
*International Harvester Co., Chicago
*John Lanson Co., New Holstein, Wis.
*J. W. A. Midell Co., Bucyrus, O.
*Rogers Bros. Corp., Albion, Pa.
*Advance-Rumely Thresher Co., Laporte, Ind.
Allis-Chalmers Mfg. Co., Milwaukee
Rates Mfg. Co., Joliet, Ill.
J. I. Case Threshing Machine Co., Racine, Wis.
Electric Wheel Co., Quincy, Ill.
Emerson-Brantingham, Rockford, Ill.
Hart-Parr Co., Charles City, Ia.
Lombard Tractor & Truck Corporation, N. Y.
Mack Trucks, Inc., New York
Mead-Morrison Mfg. Co., E. Boston
Minneapolis Steel & Mach. Co., Minneapolis
Monarch Tractors Corp., Springfield, Ill.
Shaw-Enochs Tractor Co., Minneapolis
Wehr Co., Milwaukee

TRACTOR HITCHES

*Gustav Schaefer Co., Cleveland
*Whitehead & Kales Co., Detroit
Trail-IT Co., St. Paul, Minn.

TRAFFIC LINE MARKING MACHINES

Carrara Paint Co., Cleveland, O.
Continental Prod. Co., Euclid, O.
Line-O-Graph Co., N. Y.
Littleford Bros., Cincinnati, Ohio

TRAFFIC PAINT

J. E. Bauer Co., Los Angeles, Cal.
Continental Prod. Co., Euclid, O.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Hoosier Paint Wks., Ft. Wayne, Ind.
Hanline Bros., Baltimore, Md.
Tropical Paint & Oil Co., Cleveland, O.

TRAFFIC PLATES

Alan Wood Iron & Steel Co., Philadelphia
American Pressed Steel Co., Philadelphia
Central Iron & Steel Co., Harrisburg, Pa.

TRAFFIC SIGNAL EQUIPMENT

*Toledo Pressed Steel Co., Toledo, Ohio
Acme Traffic Signal Co., Chicago
Alumoyd Sign & Signal Co., Chicago
Amer. Gas Accumulator Co., Elizabeth, N. J.
Auto Sign Display Co. of Mo., St. Louis, Mo.
Gretnay Traffic Guide Co., Madison, Wis.
Grouse-Hinds Co., Syracuse, N. Y.
Esco Mfg. Co., Peoria, Ill.
Evern-Century Sign Co., Boston
Grievold Safety Signal Co., Minneapolis
Harrington-Seaberg Corporation, Moline, Ill.
Horn Signal Mfg. Corporation, Newark, N. J.
Line Material Co., South Milwaukee, Wis.
Little Giant Co., Mankato, Minn.
Lyle-Signs, Minneapolis, Minn.
Rochester Street Signal Co., Rochester, N. Y.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
Union Iron Prod. Co., E. Chicago, Ind.
Welsbach Traffic Signal Co., Philadelphia

TRAILERS FOR TRUCKS AND TRACTORS

*Electric Wheel Co., Quincy, Ill.
*Euclid Crane & Hoist Co., Euclid, O.
*Highway Trailer Co., Edgerton, Wis.
*Rogers Bros. Corporation, Albion, Pa.
*Gustav Schaefer Co., Cleveland
Arcadia Trailer Corporation, Newark, N. J.
Detroit Trailer & Mach. Co., Detroit
Eagle Wagon Works, Auburn, N. Y.
Easton Car & Construction Co., Easton, Pa.
Fruehauf Trailer Co., Detroit, Mich.
Hercules Trailer Mfg. Co., Los Angeles
Imperial Mach. Co., Minneapolis
LaPlant-Chaste Mfg. Co., Cedar Rapids, Iowa
Lee Trailer & Body Co., Chicago
Little Red Wagon Mfg. Co., Omaha
Miami Trailer-Scraper Co., Troy, O.
Muskegon Iron Wks., Muskegon, Ohio
Smith Trailer Corp., Syracuse, N. Y.
Trailmobile Co., Cincinnati
Troy Trailer & Wagon Co., Troy, O.
Warner Mfg. Co., Beloit, Wis.
Whitehead & Kales Co., Detroit

TRAILERS, HEAVY MACHINERY

*Highway Trailer Co., Edgerton, Wis.
*Rogers Bros. Corporation, Albion, Pa.

TRAILERS, INDUSTRIAL

*Electric Wheel Co., Quincy, Ill.
*Highway Trailer Co., Edgerton, Wis.
*Lakewood Eng. Co., Cleveland, O.
*Rogers Bros. Corporation, Albion, Pa.
*Gustav Schaefer Co., Cleveland
Chase Fdry. & Mfg. Co., Columbus, O.
Clark Tractor Co., Battle Creek, Mich.
Detroit Trailer & Machinery Co., Detroit
Easton Car & Construction Co., Easton, Pa.
LaPlant-Chaste Mfg. Co., Cedar Rapids, Iowa
Lee Trailer & Body Co., Plymouth, Ind.
Miami Trailer-Scraper Co., Troy, O.
Trailmobile Co., Cincinnati
Whitehead & Kales Co., Detroit

TRAILER COUPLINGS

*Gustav Schaefer Co., Cleveland
Trail-IT Co., St. Paul, Minn.

TRAMWAYS, AERIAL WIRE ROPE

(See Aerial Wire Rope Tramways)

TRANSFORMERS

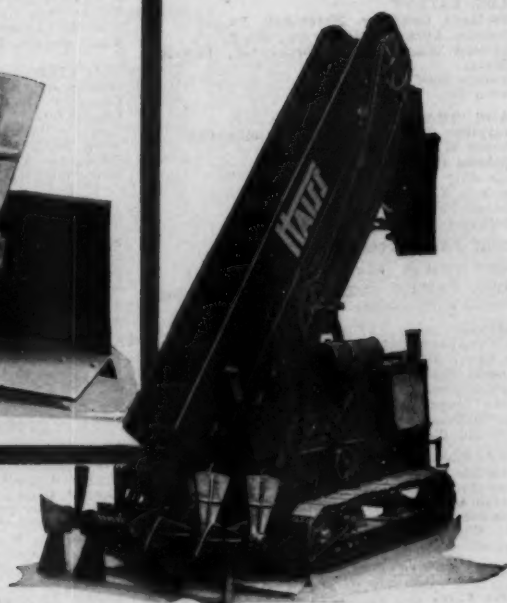
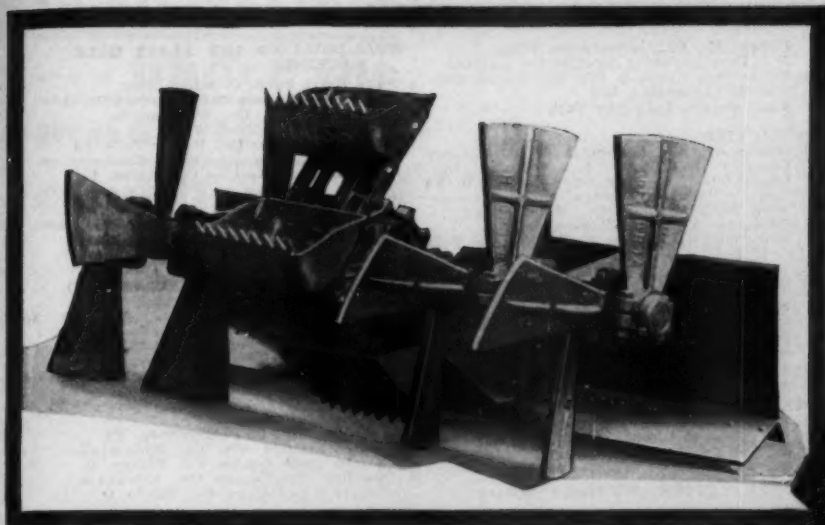
Allis-Chalmers Mfg. Co., Milwaukee
Duncan Elec. Mfg. Co., Lafayette, Ind.
Enterprise Elec. Co., Warren, O.
General Elec. Co., Schenectady, N. Y.
Kuhlman Elec. Co., Bay City, Mich.
Maloney Electric Co., St. Louis, Mo.
Packard Electric Co., Warren, O.
Pittsburgh Trans. Co., Pittsburgh, Pa.
Wagner Elec. Corp., St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TRANSITS AND LEVELS (See Instruments)

TRANSMISSION MACHINERY, POWER

*Chain Belt Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Dodge Mfg. Corp., Mishawaka, Ind.
Kent Machine Co., Kent, O.
Link-Belt Co., Chicago
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*



Exclusive

HAISS Reissue Patent Number 15,515 has been declared valid and infringed. It covers broadly the use of inclined feeding propellers or paddles on a loading machine.

Haiss is the originator of this simplest and most efficient device for making a loader self feeding, and which combines positive feeding with digging ability.

The U. S. Circuit Court of Appeals for the 3rd Circuit has sustained this Haiss patent, and that decision has become final.

GEO. HAISS MFG. CO., Inc.

142nd Street and Park Avenue New York, N. Y.



Notice To The Trade

For the protection of our Customers and Distributors we shall vigorously continue to protect our rights.

Manufacturers, Sellers and Users of Infringing Machines are alike liable to suit and injunction.

For your Loader requirements purchase a machine you can use without interruption and royalties.

Where to Purchase

TRASH CANS (See Cans)

TREADS, SAFETY

*Blaw-Knox Company, Pittsburgh, Pa.
American Abrasive Metals Co., N. Y.
American Mason Safety Tread Co., Lowell, Mass.
Concrete Steel Co., N. Y.
Norton Co., Worcester, Mass.

TREADS, TRACTION

*Caterpillar Tractor Co., San Leandro, Cal.
*Crepper Wheel Co., Reading, Pa.
*Trackson Co., Milwaukee
Belle City Mfg. Co., Racine, Wis.
Electric Wheel Co., Quincy, Ill.
Tractor Grip Wheel Co., Toledo, O.
Whitehead & Kales Co., Detroit

TRENCH EXCAVATORS (See Excavators)

TRENCH PUMPS (See Pumps, Contractors')

TRUCKS, TANK & SPRINKLER (See Wagons, Tank & Sprinkler)

TURBINES

Allis-Chalmers Mfg. Co., Milwaukee
De Laval Steam Turbine Co., Trenton, N. J.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., N. Y.
Terry Steam Turbine Co., Hartford, Conn.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

TURNTABLES FOR MOTOR TRUCKS

*Blaw-Knox Co., Pittsburgh, Pa.
Champion Engine Co., Kenton, O.
Easton Car & Construction Co., Easton, Pa.
Freeman Mfg. Co., Racine, Wis.
Hog Co., Highland, Ill.
Western Structural Co., Moline, Ill.

VALVES, CHECK

Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston
Ludlow Valve Mfg. Co., Troy, N. Y.
Mich. Valve & Foundry Co., Detroit
Rensselaer Valve Co., Troy, N. Y.

VALVES, GATE AND INDICATOR POSTS

Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston
Columbian Iron Works, Chattanooga, Tenn.
Crane Company, Chicago
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Watford, N. Y.
Iowa Valve Co., Oskaloosa, Ia.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Michigan Valve & Foundry Co., Detroit
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Watrous Co., St. Paul
R. D. Wood & Co., Philadelphia

VALVES FOR GASOLINE ENGINES

*Industrial Engine Parts Co., Inc., Cleveland

VALVES, RELIEF

*Neptune Meter Co., New York

VALVES, TAPPING

Eddy Valve Co., Watford, N. Y.
Hays Mfg. Co., Erie, Pa.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Co., Troy, N. Y.
Michigan Valve & Foundry Co., Detroit
Rensselaer Valve Co., Troy, N. Y.
Watrous Co., St. Paul
A. P. Smith Mfg. Co., E. Orange, N. J.

VALVE BOXES AND HOUSINGS

*Central Foundry Co., N. Y.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
H. W. Clark Co., Matteson, Ill.
J. B. Clow & Sons, Chicago
Columbian Iron Works, Chattanooga, Tenn.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Watford, N. Y.
Iowa Valve Co., Oskaloosa, Ia.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Mueller Co., Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Watrous Co., St. Paul
R. D. Wood & Co., Philadelphia

VOTING EQUIPMENT FOR CITIES

Automatic Registering Machine Co., Jamestown, N. Y.
Ideal Voting Booth Co., Sullivan, Ind.
Douglas Manufacturing Co., Crete, Nebr.
Pennsylvania Construction Co., Marietta, Pa.
Kerr Manufacturing Co., Lansing, Mich.
Van Dorn Iron Works Co., Cleveland, O.

WAGONS (See Dump Carts and Wagons)

WAGON BODIES (See Dump Bodies)

WAGON LOADERS (See Loaders, Gravel)

WAGONS & TRUCKS, TANK & SPRINKLER

*Joseph Honhorst Co., Cincinnati, O.
Acme Road Machinery Co., Frankfort, N. Y.

Butler Mfg. Co., Minneapolis, Minn.
J. I. Case Threshing Machine Co., Racine
Gallion Iron Works & Mfg. Co., Gallion, Ohio
Hell Co., Milwaukee, Wis.
Mack Trucks, Inc., New York

WALL TIES

Berger Mfg. Co., Canton, O.
Concrete Steel Co., N. Y.
Consolidated Exp. Metal Co., Wheeling, W. Va.
Hawley Mfg. Co., Chicago
M. & M. Wire Clamp Co., Minneapolis
Milwaukee Corr. Co., Milwaukee, Wis.
Niagara Metal Stamp Corp., Niagara Falls, N. Y.

WASHERS, SAND AND GRAVEL

Allis-Chalmers Mfg. Co., Milwaukee
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago
Smith Engineering Works, Milwaukee
Stephens-Adams Mfg. Co., Aurora, Ill.

WATCHES, STOP

*Sterling Stop Watch Co., N. Y.

WATER MAIN TAPPING MACHINES

Glauber Brass Mfg. Co., Cleveland
Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
A. P. Smith Mfg. Co., E. Orange, N. J.

WATER METERS (See Meters, Water)

WATERPROOFING COMPOUNDS AND MATERIALS

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Company, N. Y.
*Philip Carey Co., Cincinnati, O.
*Standard Oil Co. (Indiana), Chicago
Anti-Hydro Waterproofing Co., Newark, N. J.
Atlantic Refining & Asphalt Corp., Philadelphia
Euclid Chemical Co., Cleveland
Gendire Steel Co., Youngstown, O.
Master Builders Co., Cleveland, O.
Minwar Co., N. Y.
Ruhrold Co., N. Y.
Sandusky Cement Co., Cleveland, O.
Sonneborn Sons, Inc., N. Y.
Texas Company, N. Y.
Toch Brothers, N. Y.
Truscon Laboratories, Detroit, Mich.

WATER PURIFICATION (See also Filters)

*Wallace & Tiernan Co., Inc., Newark, N. J.
Cochrane Corp., Philadelphia
Paradon Eng. Co., Arlington, N. J.
R. U. V. Co., N. Y.

WATER PURIFICATION CHEMICALS

Arnold Hoffman & Co., Inc., N. Y.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Electro Bleaching Gas Co., N. Y.
General Chemical Co., N. Y.
Hooker Electrochemical Co., N. Y.
Mathieson Alkali Works, Inc., N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia

WATER SOFTENERS

American Water Softener Co., Philadelphia
Cochrane Corp., Philadelphia
Graver Corp., E. Chicago, Ind.
International Filter Co., Chicago
Permutit Co., N. Y.
W. B. Scaife & Sons, Pittsburgh, Pa.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

WATER WASTE DETECTION

Empire Electric & Water Co., Inc., N. Y.
Pitometer Co., N. Y.
Simplex Valve & Meter Co., Philadelphia

WATER WHEELS

Allis-Chalmers Mfg. Co., Milwaukee
J. Leffel & Co., Springfield, O.
I. P. Morris and De La Vergne, Inc., Hydr. Div., Philadelphia
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.
Pelton Water Wheel Co., San Francisco
S. Morgan Smith Co., York, Pa.
Worthington Pump & Machinery Corp., N. Y.

WATER WORKS PUMPS (See Pumps)

WELDING APPARATUS

*Alex. Milburn Co., Baltimore, Md.
*Orwold Acetylene Co., E. L. City, N. Y.
General Electric Co., Erie, Pa.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland, O.
MacLeod Co., Cincinnati, O.
Smith's Inventions, Inc., Minneapolis, Minn.
U. S. Light & Heat Corp., Niagara Falls
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Wilson Welder & Metals Co., Inc., Hoboken, N. J.

WELLS, CONCRETE

Kelly Well Co., Grand Island, Neb.

WELLS, GRAVEL WALL

Layne & Bowler, Inc., Memphis, Tenn.

WELL-DRILLING AND BLAST HOLE MACHINES

*The Barch Corp., Crestline, Ohio
*Sanderson Cyclone Drill Co., Orrville, O.
Armstrong Mfg. Co., Waterloo, Ia.
Burkhardt Co., Kiel, Wis.
Keystone Driller Co., Beaver Falls, Pa.
Loomis Machine Co., Tiffin, O.
Star Drilling Machine Co., Akron, O.

WELL SCREENS

A. D. Cook, Inc., Lawrenceburg, Ind.
E. E. Johnson, Inc., St. Paul, Minn.

WHEELBARROWS

*General Wheelbarrow Co., Cleveland, O.
*Lansing Co., Lansing, Mich.
Ashboro Wheelbarrow Co., Ashboro, No. Carolina
American Steel Scraper Co., Sidney, Ohio
Case Crane & Engg. Co., Columbus, Ohio
Chattanooga Wheelbarrow Co., Chattanooga, Tenn.
Cleveland Wheelbarrow Co., Cleveland, O.
Fairbanks Co., N. Y.
Jackson Mfg. Co., Harrisburg, Pa.
Puffer-Hubbard Mfg. Co., Minneapolis
Sidney Steel Scraper Co., Sidney, O.
Sterling Wheelbarrow Co., Milwaukee
Toledo Wheelbarrow Co., Toledo, O.

WHEELS FOR ALL USES

*Electric Wheel Co., Quincy, Ill.

WHEELS, CRAWLER TYPE FOR WAGONS

*Crepper Wheel Co., Reading, Pa.

WINCHES

*Becke Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, O.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Dobbie Foundry & Mach. Co., Niagara Falls
*Idgerwood Mfg. Co., Elizabeth, N. J.
*Mundy Sales Corp., N. Y.
*Gustav Schaefer Co., Cleveland
Advance-Rumely Thresher Co., La Porte, Ind.
Bethlehem Steel Co., Bethlehem, Pa.
Chisholm-Moore Mfg. Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Ersted Mfg. Co., Portland, Ore.
John T. Horton Co., New York
Ingersoll-Rand Co., New York
Mead-Morrison Mfg. Co., E. Boston
Muskegon Iron Works, Muskegon, Okla.
Stephens-Adams Mfg. Co., Aurora, Ill.
Street Bros. Mach. Works, Chattanooga

WINDOW FRAMES AND SASH (Metallic)

*Truscon Steel Co., Youngstown, O.
Wm. Bayley Co., Springfield, O.
Detroit Steel Prod. Co., Detroit
E. D. Frederick Co., Holyoke, Mass.
Gendire Steel Co., Youngstown, O.
David Lupton's Sons Co., Philadelphia
Penn Metal Co., Boston
Sykes Co., Chicago

WIRE AND CABLE

*American Steel & Wire Co., Chicago
*Williamsport Wire Rope Co., Williamsport, Pa.
American Cable Co., N. Y.
Copperweld Steel Co., Glasgow, Pa.
Fischer & Hayes Rope & Steel Co., Chicago
General Electric Co., Schenectady, N. Y.
Habishaw Cable & Wire Corp., N. Y.
Hazard Wire Rope Co., Wilkesbarre, Pa.
Mac Whyte Co., Kenosha, Wis.
Marion Insulated Wire & Rubber Co., Chicago
National India Rubber Co., Bristol, R. I.
New York Insulated Wire Co., N. Y.
Okonite Co., Passaic, N. J.
John A. Roebling's Sons Co., Trenton, N. J.
Safety Cable Co., N. Y.
Simplex Wire & Cable Co., Boston
Standard Underground Cable Co., Pittsburgh, Pa.
Tubular Woven Fabric Co., Pawtucket, R. I.

WIRE MESH REINFORCEMENT

*American Steel & Wire Co., Chicago
*Truscon Steel Co., Youngstown, O.
National Steel Fabric Co., Pittsburgh, Pa.
Wickwire-Spencer Steel Co., N. Y.

WIRE ROPE FITTINGS

*L. P. Green, Chicago
John A. Roebling's Son Co., Trenton, N. J.

WIRE ROPE (See Rope, Wire)

WOOD BLOCKS (See Paving Blocks)

WOODWORKING MACHINES

*American Saw Mill Machinery Co., Hackettstown, N. J.
*O. H. & E. Mfg. Co., Milwaukee, Wis.
R. L. Carter Co., Phoenix, N. Y.
Jaeger Portable Power Corp., Detroit
Jones Superior Machine Co., Chicago
Master Woodworker Mfg. Co., Detroit

in all weather
... under the
most trying
conditions . .

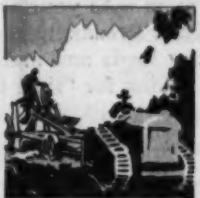


Model **LH** TRACKSON

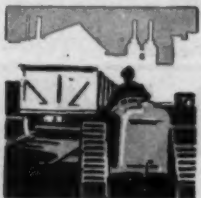
McCORMICK-DEERING



CONTRACTING



ROAD BUILDING



INDUSTRIAL

is the Outstanding Universal Full-Crawler on the Market Today!

YOUR profit depends on jobs efficiently and economically done. The difference between profit and loss lies in labor-saving . . . in how quickly, steadily your tractors and equipment can work and still "stand the gaff." The Model LH was built to meet your demand for this kind of equipment. Light in weight, yet it is so constructed as to give tremendous traction and irresistible power in slippery, soft or loose footings. The LH retains the standard traveling speeds of the Model 20 McCormick-Deering (agricultural) Tractor, and turns in its own length, pivoting on the inside track. Ease of handling has been combined with amazing power and traction. Use the LH all year 'round in all weather, to cut costs . . . with road machinery, earth-moving equipment or snowplows. Let us give you complete details of its low first cost and astonishing economy of operation and maintenance. Write . . . NOW!

Trackson Company

FULL-CRAWLERS & TRACTOR EQUIPMENT

519 CLINTON ST.

MILWAUKEE, WIS.

MODEL LH TRACKSON McCORMICK-DEERING

GET THE UTMOST from the Business End of your Crane with a BLAW-KNOX BALL BEARING BUCKET



PROGRESSIVE American Industries have accepted and profited by the reduction and elimination of wear on machinery made possible by ball bearings. Blaw-Knox took this way to make a good bucket better, and now equips 27 sizes of General Purpose, Heavy Duty, and Clean-up Buckets with BALL BEARING SHEAVES. Greatest digging power is achieved and lost time and expense for the renewal of this most vulnerable part in

buckets is eliminated. A further improvement contributing to the long life of Dreadnaught Buckets is the scientifically hardened lip which retains its sharp edge far beyond the life of ordinary buckets. You can get the exactly right bucket to go partners with your crane by specifying a Blaw-Knox Dreadnaught—it will dig fast, carry capacity loads and stand all kinds of abuse without asking for "time out."

Now ready and awaiting your order—comprehensive illustrated catalog showing sizes, weights, capacities, of 43 dreadnaughts. Write for your free copy today.

BLAW-KNOX COMPANY

667 Farmers Bank Bldg., Pittsburgh, Pa.

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Chicago

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Detroit

Birmingham
Philadelphia

Buffalo
Baltimore

San Francisco
Boston

Expert Division

Milliken Bros.-Blaw Knox Corp., Canadian Pacific Bldg., New York, N. Y.

BLAW-KNOX

**A driver, 2 men
and a "Caterpillar"**
*Move 50 yards of dirt an hour
over a distance of 500 feet!*



Five self-loading scrapers made up in a train. The "Caterpillar" Sixty starts on its way. Scraper Number 1 of the train, set to the proper depth, starts cutting. When it is full the automatic elevating machinery raises the scraper hopper. Then scraper Number 2 starts cutting. One after another the scrapers take up the work until all are full... fifty yards of material an hour moved over a distance of five hundred feet. (The entire crew is a driver, two men to operate the scraper levers...and the "Caterpillar" track-type tractor... sure-footed over soft, muddy ground, powerful for the five-fold load, quick to turn, easy to handle, comfortable for the driver...is it any wonder "Caterpillars" are doing more and better work wherever roads are made?

Caterpillar Tractor Co.

EXECUTIVE OFFICES: SAN LEANDRO, CALIFORNIA
Sales Offices: Peoria, Illinois • 50 Church St., New York • San Leandro, Calif.
Holt Combined Harvesters • Russell Road Machinery
"Caterpillar" Tractors

CATERPILLAR
REG. U.S. PAT. OFF.
TRACTOR



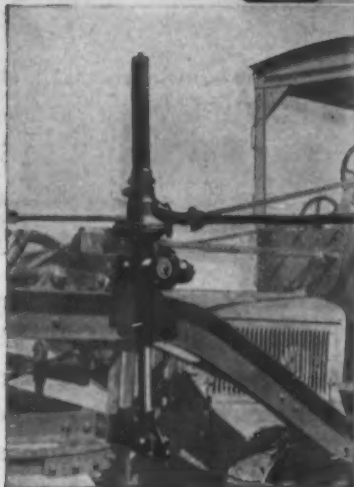
Outstanding features

Steel Screw Lifting Mechanism of Blade Assembly. More powerful Lift. Play eliminated. Compensating Spring Lift. Ball and Socket Draft Connection. Timken Bearings. Hansom Steering Control. Simplified Controls. Spring Mounted Seat. Self-Aligning Tractor Connection. Rear Cranking.

NEW SIZES NEW FEATURES



The new Russell Ten and Fifteen Motor Patrols for "Caterpillars"



The Blade-Lifting Mechanism

By means of a long, machine-cut steel screw connected to the circle crossbar by a large ball and socket joint, the blade-lifting mechanism operates so easily a child can spin the control wheel. Here is longer wearing surface, more rigidity, easier operation, wearing parts eliminated and danger of breakage done away with.

Along came two small "Caterpillars" to meet demands for traction in a small tractor. Now come two new Russell Patrols to match these small "Caterpillars".

The new Russell Ten and Fifteen Patrols are out—as alike as two peas—except in size and power. Here is new rigidity in frame and blade assembly—tightly joined from the centrally located trunion shaft mounted on self-aligning bearings to the new drawbar connection mounted on large ball and socket over the front axle. But here, also, is new flexibility in tractor and grader operation and control.

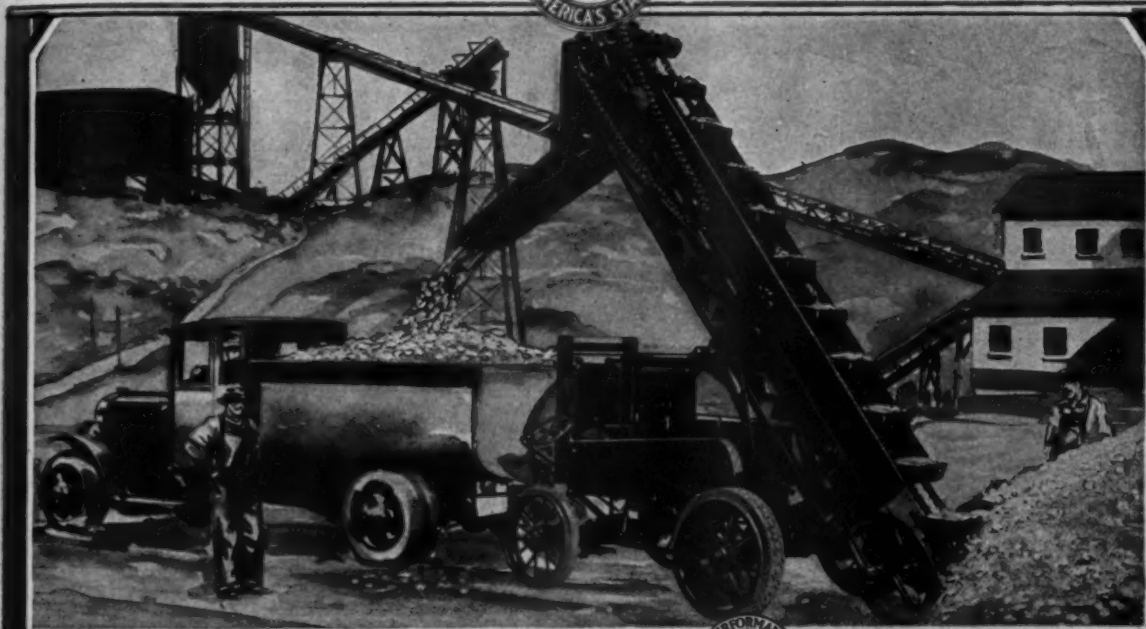
The many new features of the Russell Ten and Fifteen Motor Patrols still more forcibly link the names of Russell and "Caterpillar" with Better, Quicker, Cheaper roads—roads maintained for the fewest taxpayers' dollars.

Caterpillar Tractor Co.

EXECUTIVE OFFICES: SAN LEANDRO, CALIFORNIA
Sales Offices: Peoria, Illinois • 30 Church St., New York • San Leandro, Calif.
Holt Combined Harvesters • Russell Road Machinery
"Caterpillar" Tractors

CATERPILLAR
REG. U. S. PAT. OFF.
TRACTOR

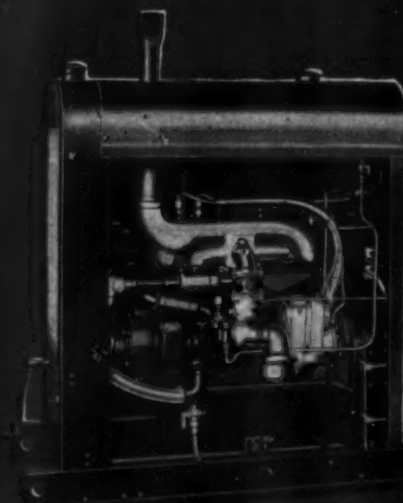
Dependable Power for Every Purpose



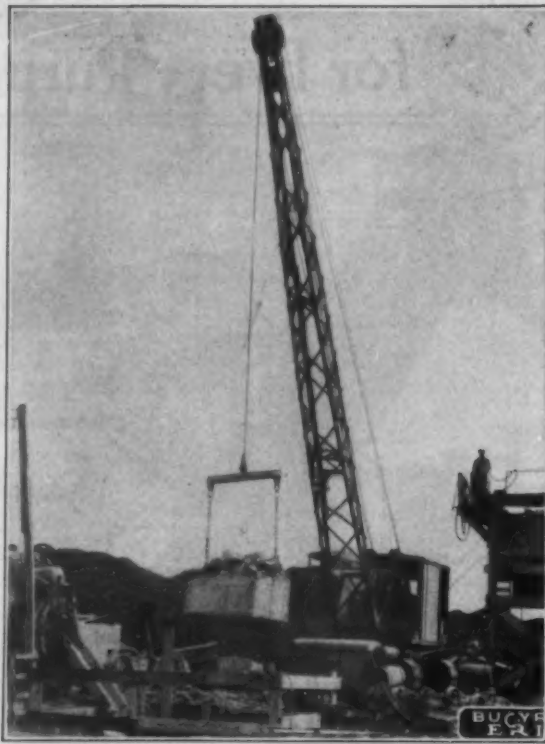
The Spearwell Mogul Junior Loader powered with a P 20 Heavy Duty Continental Engine loads trucks and other conveyances with a dependable speed that spells economy at every turn. Whether it is in building construction or road developing Heavy Duty Continental Engines furnish the power to do the job—continuously in all sorts of weather. Such performance is the result of 28 years' well-directed efforts in developing and producing gasoline power plants.

CONTINENTAL MOTORS CORPORATION
INDUSTRIAL EQUIPMENT DIVISION
Office and Factory: Michigan, Michigan

The Largest Gasoline Motor Manufacturer in the World



Continental Engines



The New Bucyrus-Erie 1020 Is Equipped with a Twin Disc Clutch.



Twin Disc Gear Drive Clutch with Fibre Driving Plate Used in Bucyrus-Erie 1020

When Only The Best Will Do

ANY equipment manufacturer whose product is used in a new Bucyrus-Erie machine has good reason to feel complimented.

Bucyrus-Erie have a wonderful reputation to maintain—a reputation created and established on many of the largest construction projects the world has ever seen. When a concern like this decides to build a new machine it is a certainty that executives and engineers will give their best thought and most careful consideration to the performance of the machine as a whole and to every component part.

Because the new Bucyrus-Erie 1020 is powered with an internal combustion engine it was necessary to use a clutch. The company could easily have built their own clutches, but they elected to use a Twin Disc unit.

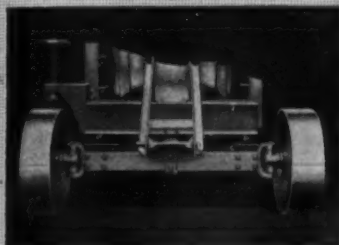
The inference is plain. When your next clutch problem comes up, give us a chance to show you what Twin Disc clutch quality and service can do for you.

TWIN DISC CLUTCH COMPANY

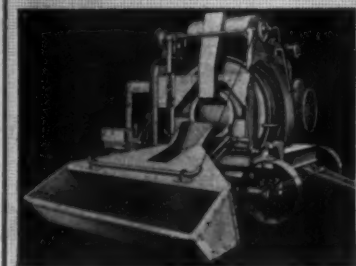
RACINE

WISCONSIN

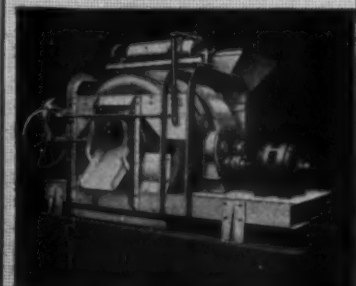
THE ORIGINAL ONE MAN END CONTROL



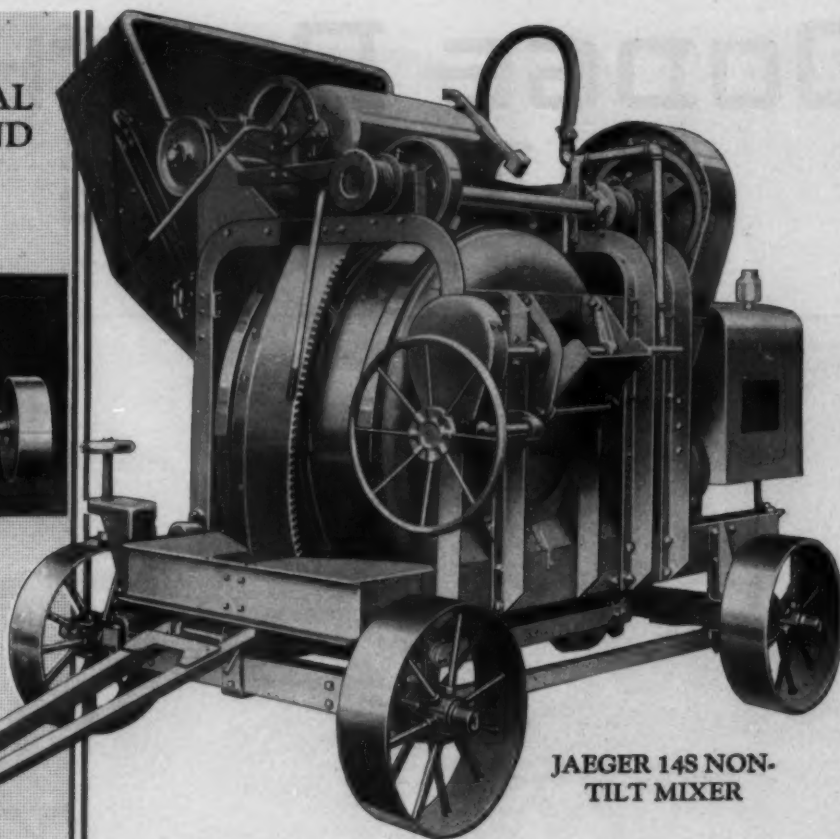
PIVOT AXLES make for easier trailing. Note jack for taking loader thrust when charging.



90 in. WIDE SKIP can be furnished for charging from truck bodies.



DIRECT MOTOR DRIVE, Batch Hopper, Track Loader, Skids or Wheels.



JAEGER 14S NON-TILT MIXER

Faster, more Compact, more Portable Half-Yard Mixer!

FROM Automatic Skip Shaker to Pivot Axles, this mixer is an engineering achievement—smooth, fast (with Skip Shaker charger, fast discharging drum), nearly 1,000 lbs. lighter (because of steel construction) and really portable.

Drum runs with machined steel tracks on chilled face ground car wheel rollers with ball bearings—minimum power and wear. One man end control is an original Jaeger feature. Construction is far sturdier than average 14S machine. First cost is moderate; operating savings are real. We can prove it.

[Get Specifications and Prices on this and famous SPEED-KING end discharge 7S—other Non-Tilters up to 28 ft. Tilters 3½ to 14S—PUMPS—TOWERS.]

THE JAEGER MACHINE CO., 701 Dublin Ave., Columbus, Ohio Date _____
Please send catalog, prices, terms on... ☐ Non-Tilt Mixers ☐ Tilting Mixers ☐ Plaster Mixers

Name _____

Address _____

City _____ State _____

JAEGER STOCKS AND SERVICE AVAILABLE IN OVER 100 CITIES OF U. S.

DODGE BROTHERS TRUCKS



CHRYSLER MOTORS PRODUCT



For your greater profit-- put Dodge Trucks to work

WORK is the sole function of any motor truck as profit is the ultimate aim of any business. Work—its quality, its quantity, its cost—must be the true measure of motor truck value.

From drawing board through to factory gate the experienced brains and skilled hands of the builders of Dodge Trucks are guided by consideration of the work each truck must do for an

owner. And world-wide Dodge service is ready, always, to keep them at work.

Hundreds of thousands of Dodge Brothers Trucks are in use by owners who prefer Dodge Trucks. Repeated purchases prove this preference. Each appraises work in his own way—yards hauled, miles run, power, speed, economy, reliability, freedom from layup. For your

greater profit—whatever your trucking needs—put Dodge Trucks to work for you.

PRICES

MERCHANTS EXPRESS—109' w.b.	\$ 545
COMMERCIAL TRUCK—120' w.b.	775
1-TON—130' wheelbase	995
1-TON—140' wheelbase	1065
1½-TON—150' wheelbase	1345
1½-TON—165' wheelbase	1415
2-TON—150' wheelbase	1515
2-TON—165' wheelbase	1585
3-TON—135' wheelbase	1745
3-TON—165' wheelbase	1775
3-TON—185' wheelbase	1845

Chassis f. o. b. Detroit

SOLD BY DODGE BROTHERS DEALERS EVERYWHERE

KOEHRING



**NO
INTERFERING
BAIL**

Independent Crowd and Hoist!

Put all the power behind either — use both—crowd the dipper "home" and with all power behind the hoist, heave the dipper! ... *Again we say, "Know the Koehring!"*

Shovel Capacities

Line of plate struck measure. Shock absorber on boom. Quickly convertible to pull shovel, crane or dragline.
No. 301 — ¾ yd. dipper on 16' stick, standard. Other dippers on proportionate stick lengths. Wisconsin 4 cylinder gasoline engine, 5¼"x6¼", 1000 R. P. M.
No. 501 — 1¼ yd. dipper on 16' stick, standard. Other dippers on proportionate stick lengths. Wisconsin 4 cylinder gasoline engine, 6"x7", 1030 R. P. M.
No. 601 — 1½ yd. dipper on 16' stick, standard. Other dippers on proportionate stick lengths. Wisconsin 6 cylinder gasoline engine, 6"x7", 760 R. P. M.

No interfering bail—that's another thing you'll like when you need to lift out boulders, old timbers, stumps, etc. — that's another reason why the Koehring is the all-service shovel!

Raise or lower boom at command of levers! No need for adjusting crowding cables! Instant readiness for any situation — high bank work, close-in digging — stripping — shallow grading — high or low dumping! Fast on its feet and as easy steering as a motor truck! ... **Know the Koehring!**

**Write for Shovel
Bulletin**

*Division of National
Equipment Corporation*

KOEHRING COMPANY

MILWAUKEE,
WISCONSIN

PAVERS, MIXERS—GASOLINE SHOVELS, PULL SHOVELS, CRANES AND DRAGLINES

Sales Offices and Service Warehouses in all principal cities

Foreign Department, Room 579, 30 Church Street, New York City



A 5090-1

Just Take Down the Sign and Open the Road to Traffic



THROUGH a quicker acceptance of your paving job you get your money without delay when you use the "Hunt Process." No cumbersome removal of dirt or straw at the end of the cure—just roll away the "Keep Off" sign and let them on! And at the same time your concrete will be actually stronger—offer greater resistance to abrasion.

By preventing evaporation of the original mixing water the "Hunt Process" effects a complete crystallization and a perfect cure results. This is done by spraying the fresh concrete a few yards behind the mixer with a special asphaltic preparation

which completely seals the pores. As the cure progresses this coating becomes an integral part of the mass.

So great are the advantages of this improved curing method that it has swept to national recognition almost over night! The first application was made only three years ago. Yet today, enough concrete has been cured by the "Hunt Process" to make a standard 20-foot pavement 500 miles long. An inquiry on your letterhead will bring you a copy of our illustrated booklet, "Curing Concrete Without the Use of Dirt and Water by the Hunt Process."

McEVERLAST, INC.

111 West Seventh St.

Los Angeles, Calif.

35 E. Wacker Drive,
Chicago, Ill.

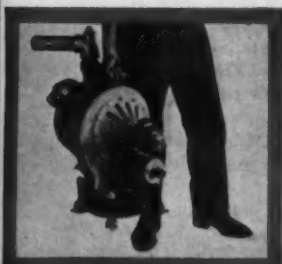
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Portable

One man—one hand carry
weighs only 75 lbs.
complete
with built-in air cooled
gasoline engine



Self Priming

Has no foot valve
and needs
none



for Volume

Pumps up to
6000 gallons
per hour



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Pumps the hole dry
and keeps it
dry

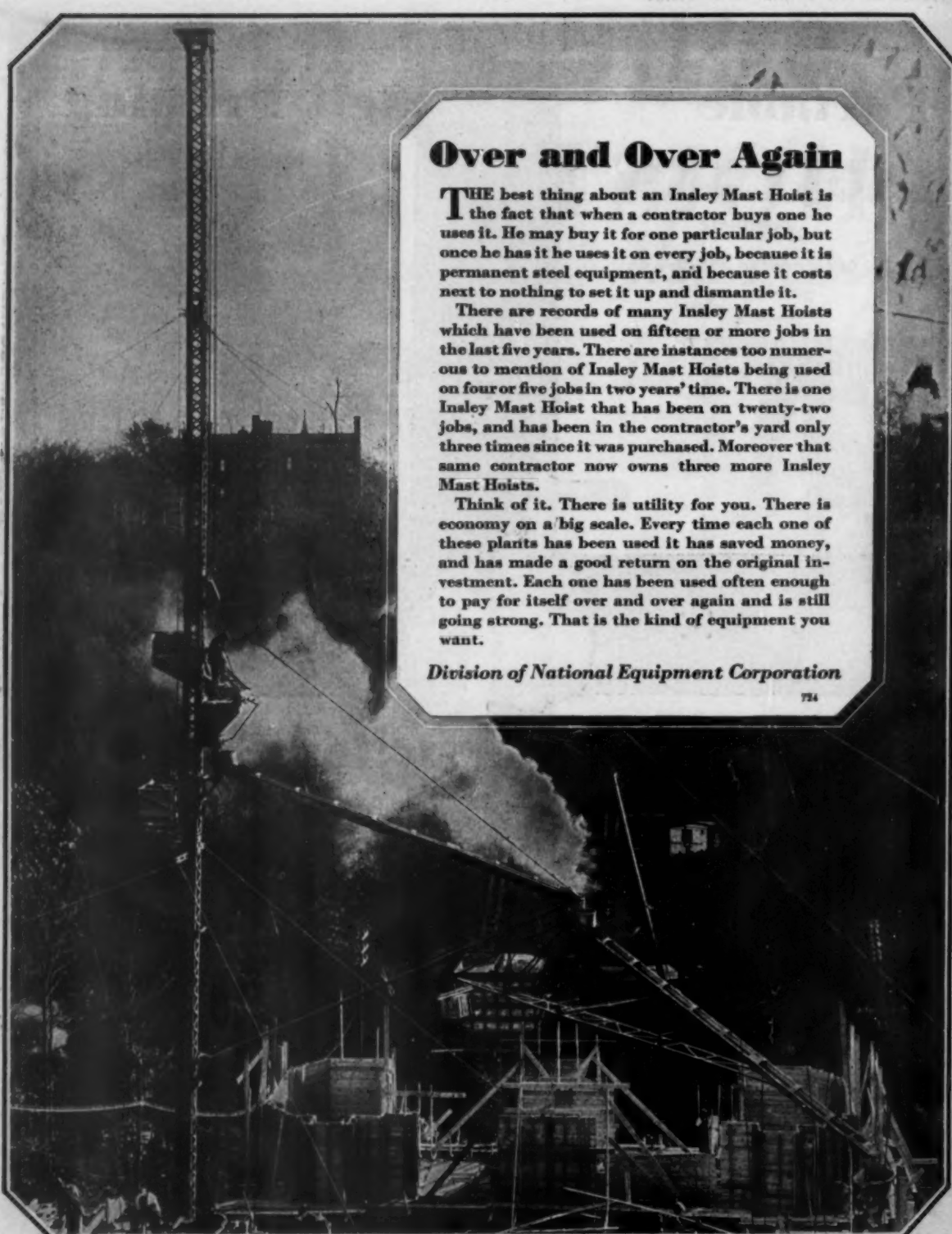


Agents all over the world for demonstration and service.

MOVIELITE

Portable Self-Priming Centrifugal Pump

Manufactured by 71 Broadway Ave. New Canaan, N.Y.



Over and Over Again

THE best thing about an Insley Mast Hoist is the fact that when a contractor buys one he uses it. He may buy it for one particular job, but once he has it he uses it on every job, because it is permanent steel equipment, and because it costs next to nothing to set it up and dismantle it.

There are records of many Insley Mast Hoists which have been used on fifteen or more jobs in the last five years. There are instances too numerous to mention of Insley Mast Hoists being used on four or five jobs in two years' time. There is one Insley Mast Hoist that has been on twenty-two jobs, and has been in the contractor's yard only three times since it was purchased. Moreover that same contractor now owns three more Insley Mast Hoists.

Think of it. There is utility for you. There is economy on a big scale. Every time each one of these plants has been used it has saved money, and has made a good return on the original investment. Each one has been used often enough to pay for itself over and over again and is still going strong. That is the kind of equipment you want.

Division of National Equipment Corporation

774

INSLEY

MANUFACTURING COMPANY — INDIANAPOLIS
ENGINEERS AND MANUFACTURERS



15 H.P. BROWN MODEL 20 HOIST

Serves 16 Bricklayers

Sixteen bricklayers kept going on the sixth floor—plenty of material going up—all with a 15 H.P. Model 20 BROWN "GIANT-LINE" HOIST.

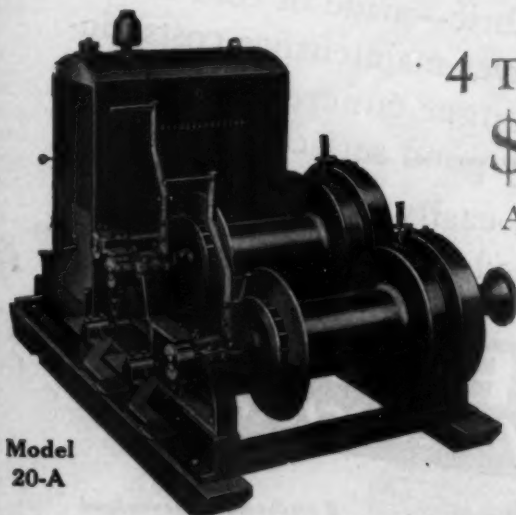
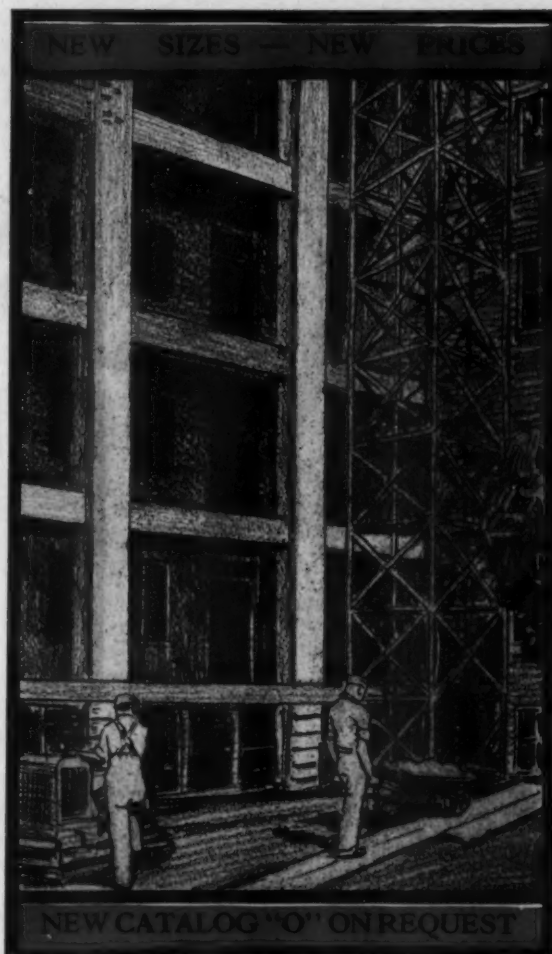
Rigged to a two wheelbarrow elevator, the Model 20 does this job easily—just one of many.

For average size building operations you can't find better values than the Brown "Giant-Line" 20 (single drum) or 20A (double drum) 15 H.P. Hoists.

They fit into a wide variety of jobs, and work steadily, satisfactorily, dependably!

Other sizes of the same standardized design from 4 to 50 Horsepower.

Remember, there are 24 years' specialization embodied in the design and manufacture of BROWN "GIANT-LINE" HOISTS!



Model
20-A

4 TO 50 HP.
\$395
AND UP



Other features include Big Bronze Bushings; Ball Thrust Bearings; Positive Clutch/Release; Non-spreading Side Frames cast separate from Bed; Alemite lubrication; Husky Machine Cut Nickle Semi-Steel Gears; Flanged Gear Guards; Spring Suspended Brake, etc., etc.

The Brown Clutch Co.

Sandusky, Ohio, U. S. A.

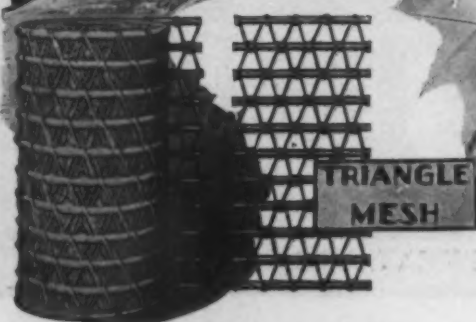
SINGLE & MULTIPLE
DRUM — REVERSIBLE

BROWN
GIANT-LINE

NON-REVERSIBLE AND
CONVEYOR TYPES

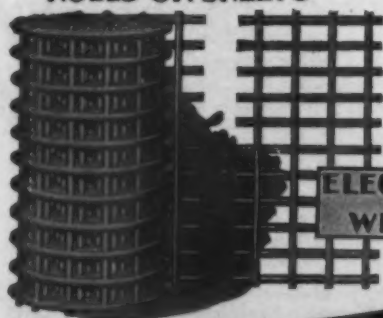
HOIST SPECIALISTS FOR MORE THAN TWENTY YEARS

WHY SAVE PENNIES IN BUILDING - And Spend Dollars In Repairing?



TRIANGLE
MESH

FURNISHED IN
ROLLS OR SHEETS



ELECTRIC
WELD

Make it a PERMANENT INVESTMENT

Don't let the nearsighted spectacles of economy blind you to the real economy of reinforcing concrete roads and streets.

Wire Fabric—made of cold drawn steel—saves maintenance costs—insures longer concrete life and a lastingly good surface.

Cut in easily handled sheets or furnished in convenient size rolls.

WIRE FABRIC

The Steel Backbone for Concrete

If you do not have our new Road Book, a copy will be mailed upon request.

AMERICAN STEEL & WIRE COMPANY

Subsidiary of United States Steel Corporation

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All boom equipment interchangeable - All mountings transferable

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4 or 6 Wheel Motor Truck

2-Speed Center Drive Crawler

CLYDE

HOISTS-DERRICKS

Where Time Is Money—

much depends upon the efficiency and performance of the hoist. The illustration shows a Clyde 45 horsepower gas hoist working for the Arundel Corp. of Baltimore, on the Saluda River dam in South Carolina. In one continuous run of 48 hours, 2000 yards of concrete were poured.

"You'll take pride in your Clyde"



CLYDE IRON WORKS SALES CO.

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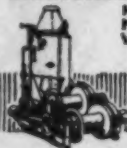
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TWO MARKS OF



GUARANTEED QUALITY





WHY WOOD HOISTS AND DUMP BODIES?

Because 18 years of practical experience in building dumping equipment for dump truck men has taught us how to built hoists and dump bodies to withstand the most severe service.

Wood All Steel Dump Bodies are reinforced at all points where greatest stress comes and vital parts are of drop forged steel—assuring solid satisfaction in performance and economy in operation.

Write for latest Catalog No. 10

Wood Hydraulic Hoist & Body Co.
Detroit U. S. A.



J-1 is a quick operating "all purpose" body. Tail gate and tail gate posts open level with floor, forming platform extension.



DIETZ NO.2 BLIZZARD THE VETERAN HIGH GLOBE COLD BLAST LANTERN

*T*HE bright red glow of Dietz Lanterns along the roadside insures the fullest measure of protection at lowest possible cost.

Dietz Lanterns shout "Danger" in every language. Everybody knows what they are and what they mean.

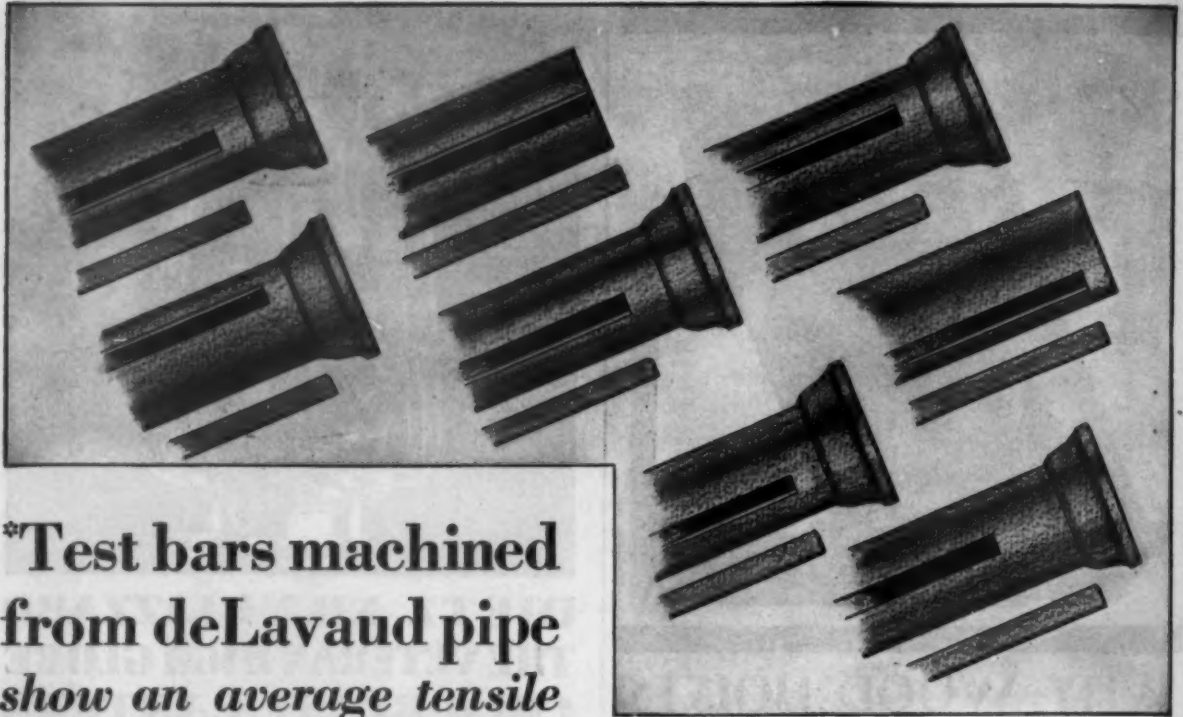
Use
RED!
No
other
color
means
danger

The Lantern illustrated, Dietz No. 2 Blizzard, meets requirements when the preference is for high-grade lanterns of large size and maximum lighting power. Made also with extra large oil fount.

R. E. DIETZ COMPANY
NEW YORK

Largest Makers of Lanterns in the World
FOUNDED 1840





***Test bars machined from deLavaud pipe show an average tensile strength of more than 17 tons per square inch**

* "The tensile strength of bars machined from deLavaud pipe averaged 35,658 lbs. per square inch. This figure is approximately 100% higher than that obtained from good pit cast pipe." (Report of actual test conducted by an outside Testing Laboratory. Details on request.)

TEST bars, machined from various locations along several lengths of deLavaud pipe, were tested for tensile strength by an authoritative and disinterested laboratory. The results gave deLavaud Pipe an average tensile strength of 35,658 lbs. per square inch. This was approximately 100% tensile superiority over pit cast pipe.

In hydraulic bursting tests, deLavaud Pipe also showed a greater strength than pit cast. In these tests, deLavaud Pipe withstood an average internal pressure of more than 3,000 lbs. per square inch or 25% higher reading on the gauge than pit cast pipe.



Cast iron pipe made by this Company bears the "Q-check" trademark of The Cast Iron Pipe Research Association.

The reasons for deLavaud's remarkable strength lie in the dense, close-grained structure of the metal and its freedom from gas bubbles and slag. deLavaud Pipe is made by pouring molten iron into a rapidly revolving cylindrical metal mould. Centrifugal force holds the molten metal against the sides of the mould and drives out impurities with a force 40 times greater than gravity.

The handbook of deLavaud Pipe gives complete information. It also contains a fund of valuable data including dimension tables, weights, and types of joints.

Write for free copy today.

United States Cast Iron Pipe and Foundry Co., Burlington, New Jersey

Sales Offices:
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Calcium-ize *your* dirt *and* gravel roads



The dust nuisance on a typically untreated road

**"3-C" Calcium Chloride
Conquers Dust—
and pays for itself in
road surface materials saved**

DUST IS AN ENEMY to cleanliness, comfort and health.

DUST IS ALSO WASTE! The dust that is allowed to blow from a road simply means the scattering of road surface material that at some time must be replaced.

"3-C" CALCIUM CHLORIDE provides the most economical and convenient means of suppressing the dust nuisance, and lowering

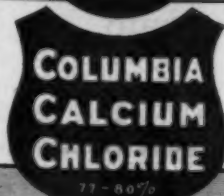
maintenance costs by acting as an efficient binder for road surface material.

In the interest of convenience, better living conditions and economy you should, by all means, get complete information concerning the advantages of "3-C" Calcium Chloride treatment for dirt and gravel roads. Please call upon our technical department to help you solve your road problems.

to THIS!



The road treated with "3-C" Calcium Chloride is dustless



The Columbia Products Co., Barberton, Ohio

SEND THIS COUPON TODAY FOR COMPLETE INFORMATION

THE COLUMBIA PRODUCTS COMPANY BARBERTON, OHIO

Please send complete information on the use of "3-C" Calcium Chloride for dust prevention.

Name

City

Street CEM-6-29

"3-C" CALCIUM CHLORIDE

IS MANUFACTURED BY THE COLUMBIA CHEMICAL DIV., PITTSBURGH PLATE GLASS CO.

Through CENTRAL SOUTH CAROLINA, on a road that's lastingly smooth



The invitingly smooth concrete highway which spirals over and around South Carolina's mountains from Newberry to Columbia. Safeguarded against climatic strains by Carey Elastite Expansion Joint, installed at thirty-foot transverse intervals.

RICHLAND County, South Carolina is studded with mountains. The concrete road to its Capital is spiraling, sheer-graded, sharp-angled. But smooth—surface-smooth, every furlong—because it is given the perfect protection of Carey Elastite Expansion Joint.

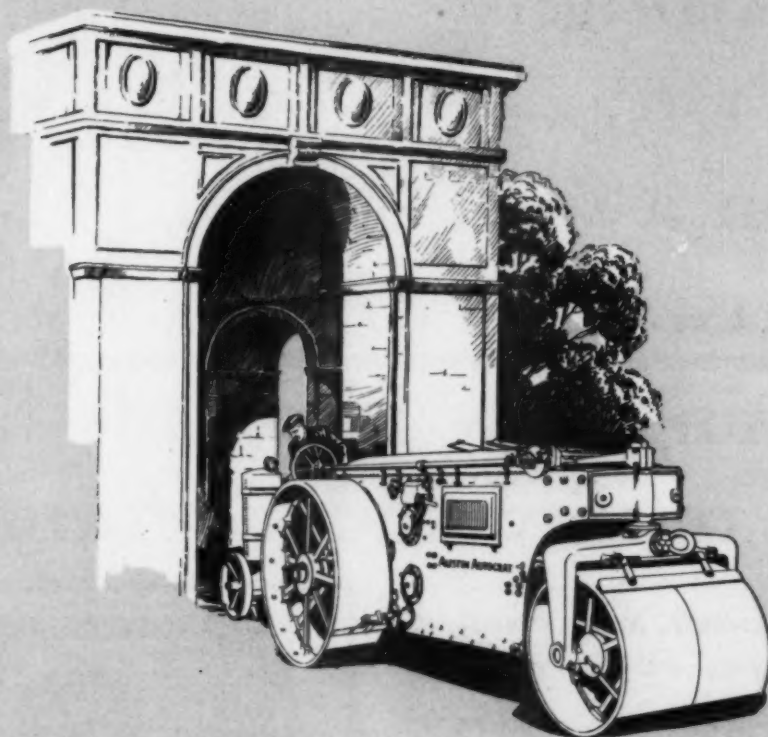
The "give-and-take," weather-proof

sandwich joint. Fibrous asphalt, pressure-bonded between holding sheets of asphalt-saturated felt. Carey Elastite Expansion Joint! It protects concrete, lastingly, against expansion stresses and contraction strains—keeps the road invitingly and permanently smooth. Easily installed; economical; indispensable. Have us send you installation particulars.

THE PHILIP CAREY COMPANY, Lockland, CINCINNATI, OHIO

**Carey
Elastite**
EXPANSION
JOINT

"MOST MILES FOR YOUR ROAD DOLLARS"



Autocrats of the road

Beyond compare! Dominating by the absolute right that unquestioned superiority gives—the experience that years bring has never been more clearly shown than in Austin Rollers.

Since building the first American motor roller, the lead has been steadily increased in all types and classes. Today, these rollers are eloquent of Austin-Western ideals and policies of service.

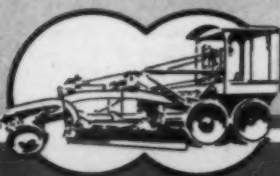
Never has greater value been offered to public officials or contractors. Fine performance with years of trouble-free service make every roller purchase an investment in good results.

As always, Austin-Western Road Machinery costs less in the long run because it gives *most miles for your road dollars*.

Austin-Western

ROAD MACHINERY

THE NEW



DUAL DRIVE

T H E A U S T I N A U T O C R A T



T H E W O R L D ' S F I N E S T R O L L E R

Setting new standards for roller quality and performance

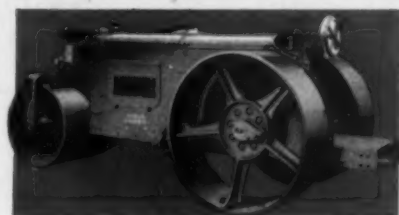
The Autocrat—the best that experience and skill can produce

The normal life of the Autocrat is years beyond that of any other roller because of the higher standard of material and workmanship. Every Autocrat feature means *better rolling performance*.

The Duplex Worm Gear Drive—the first to be used in any roller—gives the highest degree of efficiency in the transmission of power ever attained in a roller. The massive gears with large wearing surfaces in the Autocrat transmission will give years of service.

The last measure of handling ease is obtained through the three speeds, forward and reverse, and the 14" twin disc clutches that reverse the direction of the roller without shifting gears or releasing a master clutch. The handsome stream-line body is designed to give complete accessibility to all working parts and controls. Other features include an electric starter, stored electricity for parking and lighting; and power steering and a pneumatic scarifier which can be supplied as extras.

The Autocrat is made in 10 and 12 ton sizes.



The CADET

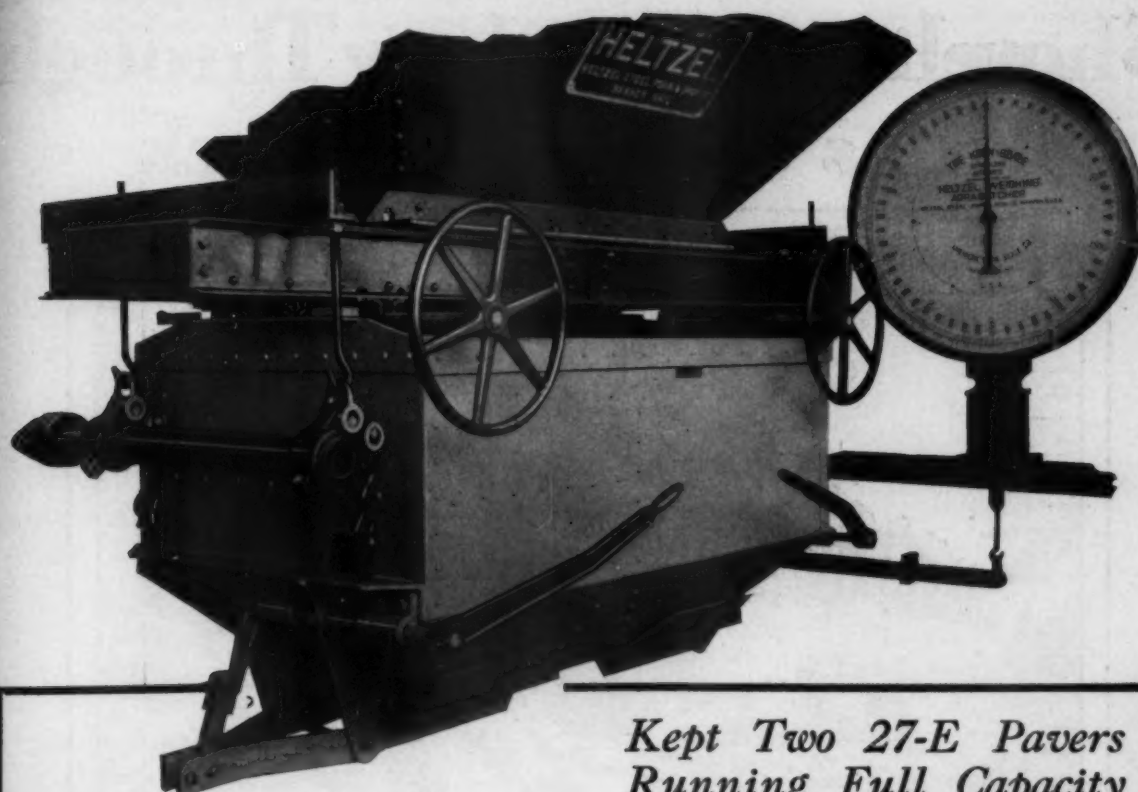
the Autocrat of Pup Rollers

The latest member of the Austin Pup Roller family is the Cadet, a completely factory-built model patterned after the famous Autocrat. It is made in 5, 6 and 7-ton sizes, all of which can be fitted with the patented Austin front planing blade and pneumatic scarifier. The short wheel base of 8'11³/₄"—three speeds forward and reverse and the powerful 4-cylinder Buda motor puts the Cadet in a class by itself among pup-sized rollers.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

400 North Michigan Avenue, CHICAGO, ILLINOIS—Branches in principal cities

Leaning Wheel Graders, Straight Wheel Graders, Motor Graders, Elevating Graders, Crawler Dump Wagons, Scarifiers, Rock Crushers, Portable Conveyors, Motor Sweepers, Street Sweepers, Sprinklers, Road Oilers, Hot Patch Portable Asphalt Plants, Plows and Scrapers



*Kept Two 27-E Pavers
Running Full Capacity*

HELTZEL Weighing Plant Springless Scale Type



*Heltzel 1930 Armor Plate
Road Form*



*Heltzel Curb and Gutter
Forms*



Heltzel Sidewalk Forms

Note the simplicity of the American Kron Springless Scales as used on Heltzel Bins. No poises, counterweights, auxiliary dials or complicated mechanism to confuse the operator. A large 3-foot dial, easily read from any position on the platform, is his guide.

Material is weighed and loaded faster than the trucks can carry it away. It was this ease of handling and speed of operation that caused

York Engineering Co. to be enthusiastic about this modern weighing plant.

On the York job two 27-E Pavers were kept going at full capacity on an 18-foot road 9 inches in depth and 11 miles long.

It is performance of this kind that reduces the costs on road jobs—that turns possible loss into gain, and increases the scope of contractors' operations. Write for details.

"The Heltzel way is the correct weigh"

**The HELTZEL
Steel Form & Iron Company**
Warren, Ohio

Send us proof of Speed, Accuracy and Dependability of the Heltzel Weighing Plant

Name.....
Address.....
City

CEM 6-29

Shoveling a Roadway Through Miles of Blasted Rock



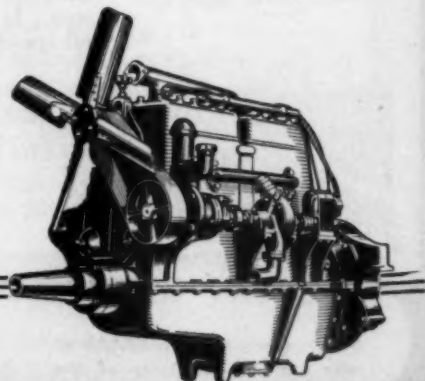
CUTTING a highway through a boulder-littered hillside at Columbia, Alabama, a Hercules Powered Byers Master easily accomplished the severest tasks that could be required of a power shovel.

On tough excavation jobs Hercules powered gas shovels invariably make good. Shovel operators and manufacturers give credit to Hercules Engines for many records of outstanding performance.

Hercules Engines are available for all types of construction and road maintenance equipment, as well as for shovels up to 1-1/4 yard capacity, either in four or six cylinder models. Write for complete information.

HERCULES MOTORS CORPORATION
CANTON, OHIO, U. S. A.

West Coast Branch : Los Angeles, Cal.



HERCULES ENGINES

NEW LANSING 3½-T Mixer



New Lansing 3½-T Mixer

THIS new mixer is equipped with Hyatt Roller Bearing wheels and can be trailed at high speed. The outfit is furnished with wide-tread, cushion tires and spring shock absorbers, which means longer life for both the engine and mixer. Mixing drum is extra large, accommodates full batch without stopping. Drum has four steel mixing blades, which insures quick and through mixing.

Being equipped throughout with Hyatt Bearings and Alemite Fittings the New 3½-T is easy running and requires little attention. Equipped with the reliable Lauson 2 hp. engine with Wico high-tension magneto.

Write for full and complete information and prices. Dept. CM.

LANSING-COMPANY

Lansing, Michigan

CHICAGO, NEW YORK, BOSTON, MINNEAPOLIS, SAN FRANCISCO, PHILADELPHIA,* KANSAS CITY

WAIT!

Don't Buy A Clamshell Bucket

Until You See

ERIE'S NEW Multi-Power

It's New! — Not Rehashed

Send for information and prices giving size desired

ERIE STEEL CONSTRUCTION COMPANY

Erie, Pa.

Thor

"SIX" AIR COMPRESSOR

Gives You Super Performance Plus Low Upkeep Costs



Because of the Super-Charger and Modern Design

The Thor Six Air Compressor is the only Compressor with a super-charger. This Super-Charger, which is a patented feature enables the Thor to deliver 26 per cent more air than any other Compressor of the same rating, because it utilizes the idle or downward stroke of the piston to compress this additional air. There is nothing complicated about the Super-Charger. It is simple and fool-proof. And it gives you more air for your money, which is what you want when buying a Compressor.

The Thor is the lightest, most compact and most powerful compressor of its size on the market. As it has no clutch, no coupling, no gears, it is the simplest unit made, with a record for low upkeep cost. Cast steel is used in the frame of the Thor in place of structural steel, as it eliminates useless weight and minimizes vibration.

The Thor is made in two sizes: 116-foot rated capacity, which actually delivers 96 feet of air per minute, and 250-foot rated capacity, which actually delivers 210 feet of air per minute. Compare this performance with any other Compressor performance and you will quickly realize why the Thor is the best Compressor buy on the market.

INDEPENDENT PNEUMATIC TOOL CO.
PNEUMATIC TOOLS 248 S. Jefferson St. CHICAGO ELECTRIC TOOLS



One of the
Many Real Good
Things Found in
the
DOBBIE LINE

Oil Reservoir Sheaves for Long Life,
High Speed and Heavy Duty—
Cast Steel and Semi-Steel

Write for Catalog
Describing

DERRICKS,

Steel and Wood,
Stiff Leg and Guy

Also



HAMMER HEAD CRANES,
DERRICK FITTINGS,
BALL AND ROLLER-BEARING
SHEAVE BLOCKS AND MAST
FOOT BLOCKS.

HAND WINCHES

*Capacities from
100 pounds to 50,000 pounds
for Every Purpose*

Write Direct to Factory

DOBBIE FOUNDRY & MACHINE CO.
Niagara Falls, N. Y.

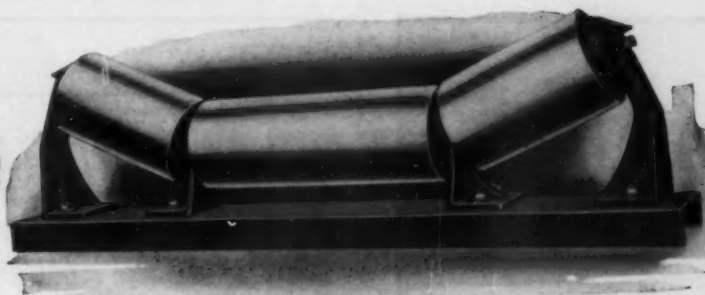
Timber Derrick Fittings
Sheaves—Hand-Winches—Blocks



Complete Stock Carried at Niagara Falls

Also

G. S. GREEN CO.
74 Warren Street, New York City, N. Y.



THESE ARE SUPER-CONWEIGH THREE-PULLEY TROUGHING IDLERS WITH OUTBOARD BRACKETS

We were the designers and builders of the conveyors used for constructing the concrete anchorage on the New York side of the Hudson River Bridge, which is to have a span twice as long as that of any other bridge in the world.

The idlers illustrated have malleable iron outboard brackets; Alemite lubrication. They are equipped with either Timken roller bearings or S. R. B. ball bearings.

We are the original designers and builders of ball bearing idlers.

THE CONVEYING WEAHER COMPANY

90 WEST STREET

Agents:
Wells Fargo & Co. Express, S. A., Mexico, D. F.

NEW YORK



TRENCH WITH DRY WALLS AND BOTTOM
21 FEET BELOW WATER LEVEL

Absolutely dry trench—21 ft. below water level!



DRAINAGE SYSTEMS AND PUMPS DID THE TRICK

To lay pipe in water-soaked sand 21 feet below water level is usually a difficult job—but—"DOMESTIC" Pumps and "DOMESTIC" Point Drainage gave firm sides and dry bottom trench on this job at Gary, Indiana.

If your job requires the drying-up of specified areas for trench work, foundation work, etc., in water soaked-soils, our Bulletin No. 288 will interest you. This "copyrighted" illustrated booklet contains much data of real value to every Engineer and Contractor. A copy is yours FREE—for the asking.

"DOMESTIC" DRAINAGE SYSTEMS

give

**Safety, Speed and
Profits**

on jobs below the surface
of water saturated soils



SPECIAL DOUBLE PLUNGER PUMP
Successfully used with "DOMESTIC"
Drainage Point Systems

DOMESTIC ENGINE & PUMP CO., Shippensburg, Pa.

C&E 6-29



Bailey Avenue, Hillside, N. J. A concrete street being cured with Curcrete immediately after the surface was broomed.

The easy modern method that cures concrete perfectly!

The curing of concrete roads and streets with water, burlap, hay, earth or chemicals is fast becoming obsolete. The easy Curcrete method is the new positive way.

"What is Curcrete?" A special emulsion of bitumen—applied in the form of a fine spray to freshly finished concrete—while it is still soft and wet. The Curcrete method stops evaporation of water from the concrete—immediately. It prevents surface checking and subsequent scaling. It insures maximum and uniform strength.

The sufficiency and thoroughness of the application are visible to both the contractor and the inspector, and no further attention is necessary after Curcrete is applied.

The cost of curing by the Curcrete process is no more than any other method—less than some of the former standard methods. One gallon of Curcrete covers 8 to 10 square yards, and 150 to 200 square yards per hour can be cured by our specially-designed pressure sprayer, operated by one man.

The Curcrete process is now in extensive use, and we will be glad to send you upon request the Curcrete booklet which gives full information together with results of tests.

THE BARBER ASPHALT COMPANY

New York Philadelphia Chicago
Pittsburgh St. Louis Kansas City San Francisco

"Curcrete" (trade-mark registered) is sold for use in the curing of concrete by the "Curcrete" method (U. S. patents 1,839,763 and 1,884,671, and foreign patents pending) controlled by The Barber Asphalt Company. The Barber Asphalt Company grants to the purchasers of "Curcrete" the right and license to practice the "Curcrete" method of curing concrete, controlled by it, in connection with the use of "Curcrete" produced by it, and the purchasers by accepting "Curcrete" accept the license and acknowledge the company's rights in connection with the "Curcrete" method.

CURCRETE

Newark

REINFORCED CONCRETE PIPE
"It makes a better joint"

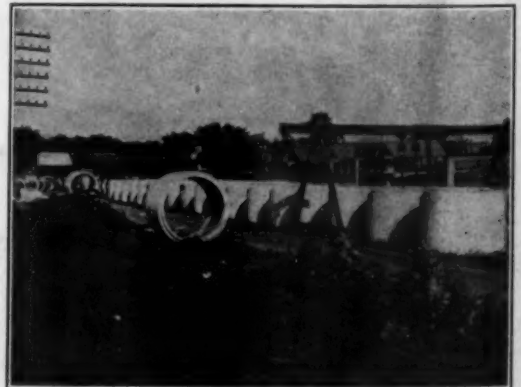
**Easily laid at
small expense
with perfect
flow line.**

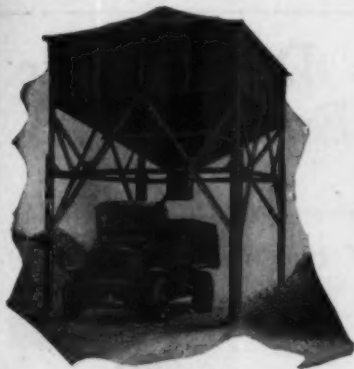


NEWARK CONCRETE PIPE COMPANY

462 Broad St.

Newark, New Jersey





THE ONLY BINS BUILT ENTIRELY OF COPPER BEARING STEEL

To produce a bin of the best possible engineering design and enduring qualities, Beaumont Bins are built entirely of copper bearing steel plate. They are the only bins on the market with this feature.

9 big features

1. Constructed of copper bearing steel plates which insures the bin lasting two to three times as long as ordinary steel bins.
2. Structurally rigid, properly designed and all bolted construction.
3. Built in standard sizes to answer all possible requirements.
4. Easily portable.
5. Full gravity discharge, no clogging in the bins and at gates.
6. Speeds up material handling.
7. No projecting columns to prevent bins being placed side by side.
8. Ample truck clearance is provided.
9. Easy erection. Shipped in a few parts that are all match-marked and accurate as to hole spacing.

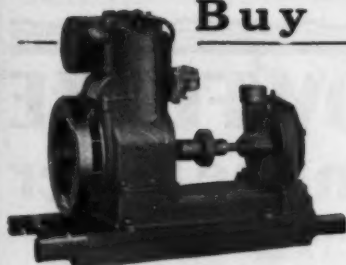
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BEAUMONT MANUFACTURING CO.
330 Arch Street
PHILADELPHIA

2103-E Straus Bldg.
CHICAGO

BEAUMONT COPPER STEEL BINS

Buy a *LAUSON* for Satisfaction



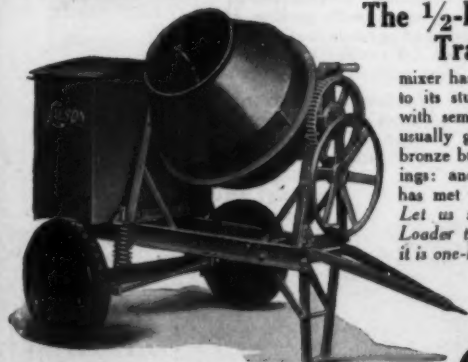
Centrifugal Pump Units

Semi-portable or mounted on substantial 2-wheel trucks. Powered by the Lauson Vertical Motor—one of a group we developed for application to all sorts of portable and stationary units. Neat, compact, self-contained, light weight, but with all parts substantial enough to give continuous service. Made in air- and water-cooled types.

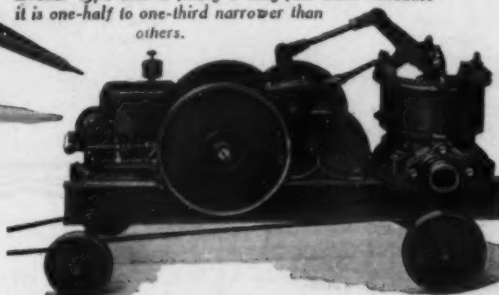
The 1/2-Bag Spring-Mounted Semi-Trailer Mixer

This popular little mixer has won a substantial place in the industry due to its sturdy construction and well-balanced design with semi-automatic discharge, dependable lock, unusually good blade action, drum-spindle mounted on bronze bushings—the original job with Timken Bearings; and our recent addition of Spring Mounting has met with instant appreciation.

Let us send you our Mixer Bulletin including a Loader type that is filling a long-felt want—because it is one-half to one-third narrower than others.



We also manufacture a full line of Horizontal Engines, 1 1/2 to 30 hp.; Heavy Duty 35-45 hp. Power Units; Plaster and Mortar Mixers, etc.



30 Years

of high reputation for quality goods and satisfaction with the service they give are behind all Lauson products. You can buy with perfect confidence based on our policy: *Enduring quality at fair prices.*

Fully Enclosed Jack Diaphragm Pumps

Jack drives direct from high-grade Lauson engine crank-shaft through single set of machine-cut hardened gears, fully enclosed, running in oil. Bronze bearings.

Four Iron Wheels or solid rubber-tired semi trailer styles.

Complete units, or minus pump with all fittings to mount your own.

Electric motor if preferred.

THE JOHN LAUSON MFG. CO. 11 Jackson St., New Holstein, Wis.

Schaefer
CLEVELAND



Schaefer
CLEVELAND

THE OUTSTANDING ONE-MAN TRACTOR SCRAPER

Used the world over for roads, parks, cemeteries, golf and airplane landing fields, digging cellars, grading around new schools, laying out allotments, filling trenches, etc., this earth-moving tool has been found to be:

Labor-saving (one-man-operated)

Handy and easy to run (loading and dumping, spreading and leveling, are all handled from the driver's seat—and there's nothing to oil or adjust)

Low in upkeep cost (parts are few, strong and simple)

Four sizes: scraper widths, 4, 5, 6, 7 feet.

The Gustav Schaefer Company

4190 LORAIN AVE.

Established 1880

CLEVELAND, OHIO

Let Us Demonstrate a Buster—

on any of
these jobs—

1. Breaking concrete
2. Removing asphalt
3. Demolishing old building walls and foundations
4. Sheet pile driving
5. Shallow rock drilling
6. Back fill tamping
7. Any of the many other jobs contractors are doing profitably with Busters.

If you have a job you think a Buster can do—call the nearest Sullivan distributor or branch office. (Consult phone book under Sullivan Machinery Company.) We will be glad to demonstrate on your job. For catalog B.V. write the Sullivan Machinery Company.



Buster equipped with pile-driving head

SULLIVAN MACHINERY COMPANY

814 WRIGLEY BUILDING, CHICAGO

SULLIVAN



O-K
HOISTS

MR. CONTRACTOR TAKE YOUR PICK—

There's an O. K. Hoist for every job:
Single, double or triple drum
Gasoline or electric power
3-5 hp. in single-cylinder engines
8-150 hp. in 2-, 4-, 6-cylinder engines

Every one is sturdy, comparatively light in weight, easily moved from place to place, easily operated.

See all the different models as shown in our Catalog No. 28.

O. K. CLUTCH & MACHINERY CO.

Builders of good machinery since 1904
Columbia, Pa.

Put DOWFLAKE Right in the Mixer

The use of Dowflake Calcium Chloride as a curing and accelerating agent enables contractors to speed up work with greater efficiency and permits road officials to open up pavements in half the time without sacrificing strength.

Dowflake added to the mix in the form of a solution permeates the entire mix and results in a quick setting, uniformly cured slab. It cuts curing time in half, eliminates ponding, and reduces surface cleavage, voids and pitting.

Send for our free book
"How to Cure Concrete."

THE DOW CHEMICAL COMPANY
Midland Michigan

Branch Sales Offices:
90 West Street, New York City
Second and Madison Streets, Saint Louis

DOWFLAKE
CALCIUM CHLORIDE



EUCLID ^{TRACK WHEEL} WAGONS



No Hill too Steep

Follows the Track of the Tractor

BRING THE WAGONS TO THE SHOVEL

Any place that a shovel or a tractor can go, Euclid Track Wheel Wagons can follow. Hillside, swamp, fill or cut, work goes on without delay. Earth moving costs are cut to a minimum.

One man easily handles both dumping and door closing of a full train of Euclid Wagons. Hyatt Roller Bearing and levers in handy positions make all operation simple and easy.

Sturdy construction, Track-Wheel design and wagon capacities to meet every requirement result in continuous service and low haulage costs with Euclid Wagons.

Our new catalog was written for you, and contains many interesting facts on earth haulage. Write for your copy now.

THE EUCLID CRANE & HOIST CO.
EUCLID, OHIO

ATLAS Portable Belt CONVEYORS

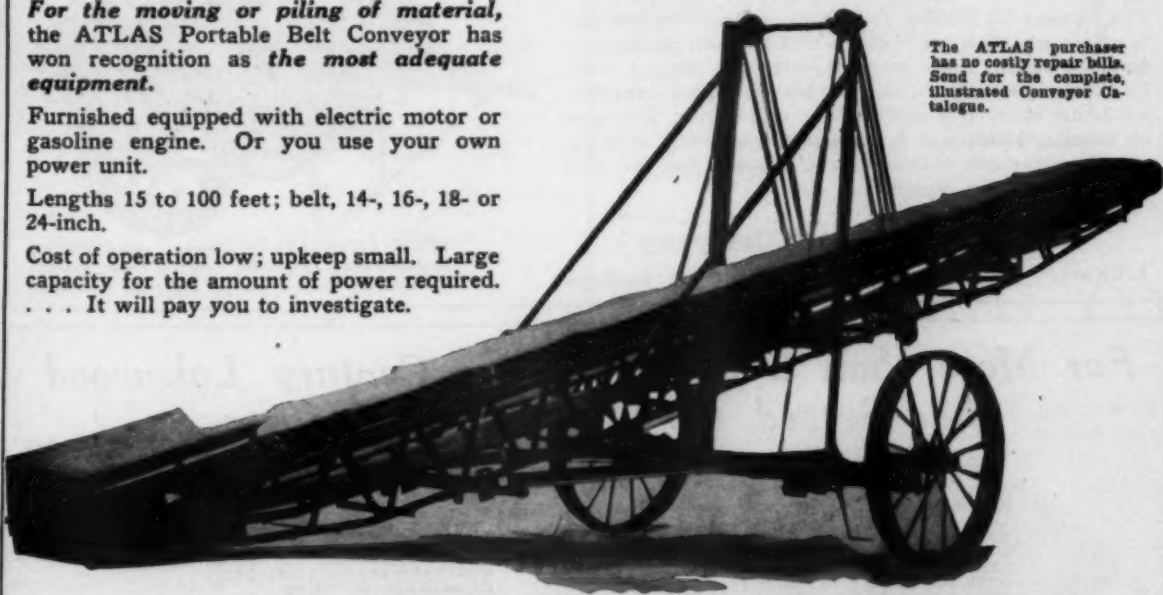
For the moving or piling of material, the ATLAS Portable Belt Conveyor has won recognition as the most adequate equipment.

Furnished equipped with electric motor or gasoline engine. Or you use your own power unit.

Lengths 15 to 100 feet; belt, 14-, 16-, 18- or 24-inch.

Cost of operation low; upkeep small. Large capacity for the amount of power required. . . . It will pay you to investigate.

The ATLAS purchaser has no costly repair bills. Send for the complete, illustrated Conveyor Catalogue.



ATLAS ENGINEERING COMPANY

Box "N"

Manufacturers of Bucket Elevators—Loaders—Tractors, Etc.

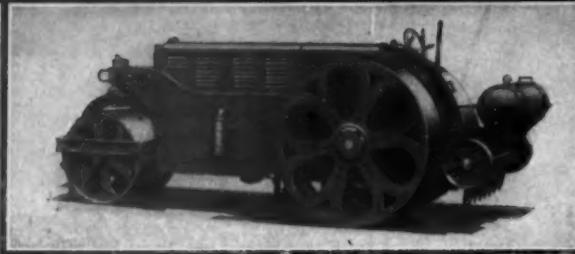
Branch Office

Clintonville, Wisconsin

Milwaukee, Wisconsin

HUBER

**4 CYLINDER
MOTOR ROLLERS**
POWERFUL AND
DEPENDABLE
QUICK IN ACTION
ECONOMICAL TO
OPERATE



MADE IN FOUR SIZES
5-7-10-12
TONS
SEND FOR HUBER
ROLLER
CATALOG

330 E. CENTER ST. THE HUBER MANUFACTURING CO. MARION, OHIO

**PUNCHES, DIES
AND
RIVET SETS**

**CHIPPING CHISELS
AND
SPECIAL TOOLS**

are shown in our new Catalog No. 9

THE CLEVELAND CO.
STEEL TOOL CO.

Punches, Dies, Chisels, Rivet Sets
660 E. 82nd St. Cleveland, O.

SAVE MONEY in Heating Asphalt Tamping Tools

This Chausse Oil Burning Tool Heater will save its own cost in a few weeks. It is one of the greatest labor-saving machines made for asphalt street work. It starts in 5 minutes, heats cold tools in 15 minutes, does not burn tools, has no sparks, smoke nor ashes. It is unaffected by wind or rain. Has space for warming 6 buckets of A. C. without overheating. Is widely used by cities and contractors and is considered the most modern asphalt fire wagon.

Chausse Oil Burner Company

Elkhart,

Indiana



OTHER PRODUCTS—Oil Burning Surface Heaters, Asphalt Plants, Tar Kettle, Concrete Mixer Heaters, Kerosene Torches. Write for illustrated catalogues.

For More than a Quarter of a Century Lakewood has Served the Construction Industry

Paving Equipment

FINISHING MACHINES
SUBGRADERS
CARE ROAD FORMS
GRADEROOTERS
FLOATBRIDGES
ALUMINUM STRAIGHT EDGES
HATCH BOX CARS
STEEL HATCH BOXES

Construction Equipment

CONCRETE MIXERS
STEEL TOWERS
CHUTING EQUIPMENT
MAST CHUTE PLANTS
CONCRETE CARTS
CONCRETE BUCKETS AND CARS
CLAMHELL BUCKETS
BIN GATES
NARROW GAUGE TRACK AND V-DUMP CARS

Write for Bulletins

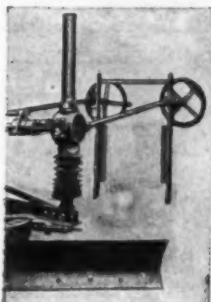
THE LAKEWOOD ENGINEERING CO.,

Cleveland, Ohio

Warco Products do the job..easily.. quickly..efficiently.



FEW of us work for the love of the work alone . . . most of us cannot afford to put in our time just for the fun we get out of it . . . the job must put money into our pockets if we are to continue in business.



The Warco
Screw Lift—
"Built like a
Screw Jack"

Spinning the freely turning wheels in the cab, operates the screw lift through the circle controls and easily raises and lowers the grader blade.

Dependable under all conditions, WARCO road machinery enables you to make money on any road building or earth moving job . . . and get fun out of doing it!

[Interesting new bulletins are yours for the asking—let us send them to you with the name of our distributor in your vicinity.]

WARCO



W.A. RIDDELL COMPANY
BUCYRUS · OHIO · U.S.A.

FLORY

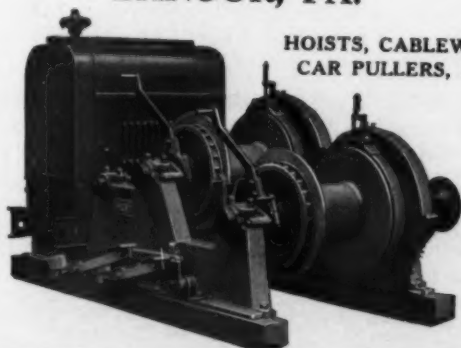
"FLOR-OX" 35 and 50 LEAD IN THE GENERAL CONSTRUCTION FIELD

FLORY'S New Hoists—the "FLOR-OX" 35 and 50—have many new features that make them leaders in the hoisting field. The "FLOR-OX" is marked by smoothness of operation, the utmost dependability and extreme ruggedness of construction. It can be powered by either a gasoline or electric motor and it can be altered in the field from a single to double or triple drums by bolting units together. Before you buy a hoist send for the bulletin on this new hoist. It has no equal in the general construction field.

FEATURES OF THE "FLOR-OX" 35 and 50

- ROLLER BEARING THRUSTS FOR FRICTION CLUTCHES
- LESS WEIGHT AND SPACE WITH GREATER EFFICIENCY
- POSITIVE RELEASE DEVICE ON FRICTION LEVERS
- ALEMITE LUBRICATION
- THE "35" HAS A ROPE PULL OF 5000 POUNDS AT 165 FEET PER MINUTE
- THE "50" HAS A ROPE PULL OF 7000 POUNDS AT 165 FEET PER MINUTE
- EXTRA HEAVY SHAFTS AND BEARINGS
- SILENT CHAIN DRIVE ENCLOSED IN DUST PROOF CASING
- MACHINE CUT TEETH ON ALL MAIN GEARS AND PINIONS

S. FLORY MFG. CO.
BANGOR, PA.



HOISTS, CABLEWAYS,
CAR PULLERS, ETC.

Pelican



DRAWING INKS

black and white and 18 brilliant shades
Send for color chart "A"

Pelican Works—Gunther Wagner, Inc.
34 East 23rd Street, New York



You Can't Pour Concrete in the Rain

FORCED interruptions of work—expensive equipment idle—interest, depreciation and overhead eating into profit. Unseasonable weather is no respecter of contracts. That is one reason why so many contractors put Carbic Flood Lights on every important job. They know that the best way to make up for lost time is to work full force while the season is on, to keep going night and day.

With Carbic Flood Lights your night shift can insure safety. The great power in the clear white rays of Carbic Light is perfectly diffused. There is no glare—no dark shadows. It penetrates fog, smoke or dust. It is a good light to work by.

The Carbic Flood Light is low in first cost and inexpensive to operate. It is simple, rugged and portable.

Get in the hours while the weather is right—use

CARBIC LIGHT

OXWELD ACETYLENE COMPANY

Units of Union Carbide and Carbon Corporation

NEW YORK CITY: Carbide and Carbon Bldg. CHICAGO: Carbide and Carbon Bldg.
SAN FRANCISCO: Adams Great Building



Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.



SEALTIGHT MEANS PROTECTION

The best argument for insurance is the maximum protection for a minimum expenditure.

SEALTIGHT products give maximum protection at low rates to both consumer and contractor.

These products are the "go between" that take the abuse. Use SEALTIGHT on your next job for insurance.

PRODUCTS—Expansion Joints Rail Filler Protection Planks Crossing Planks Bridge Flooring Industrial Flooring

Address inquiries on Rail Filler Protection Planks, Crossing Planks, Bridge Flooring, Industrial Flooring to our agents.

The Universal Asphalt Plank Co.
8 N. LaSalle Street
Chicago, Ill.

W. R. MEADOWS, Inc.

ELGIN, ILL.

Make the Job right—
use "Sealtight"

MUNDY HOISTING ENGINES

"Standard of the World"



Steam, Gas and Electric Hoists, Dredge Hoists, Belt Hoists, Ship, Cargo and Dock Winches, Capstans, Cableways

Catalog Upon Request

J. S. MUNDY HOISTING ENGINE CO.
722-40 Froelighuysen Ave. Newark, N. J.

This tool can help you!

[The Killefer Road Ripper breaks out material for scrapers, graders, bulldozers, loaders, or may be used for roughing out and bonding.]



Working depth as deep as 12" (Photo at left shows our No. 10 Ripper breaking 3" of asphalt macadam on 9" of coarse rock ballast.)

Has accurate depth adjustment and great clearance below frame.

Equipped with rapid power lift.

Quick-detachable points are practical and economical.

Wheel tires are smooth for road travel.

Built in 2 models. You'll praise the work of the Killefer Road Ripper. There are 5 years of successful performance behind it.

Here's a tool with tractor strength!

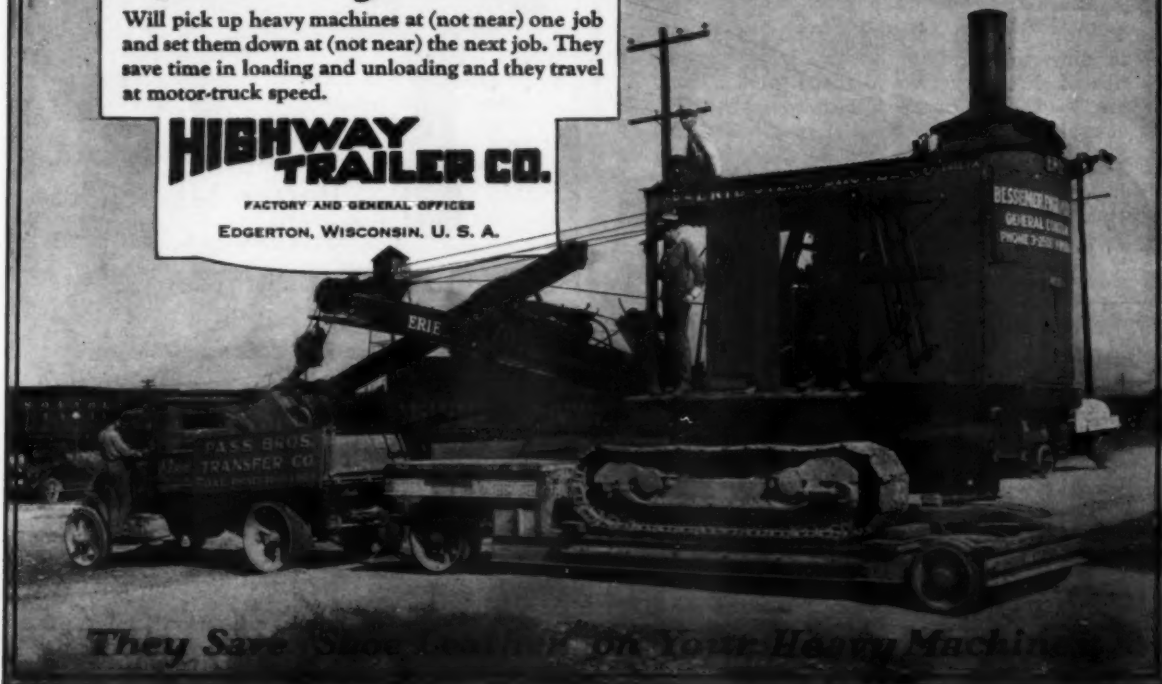
Write for folder R-94 and name of nearest dealer. Agencies throughout U.S. and Canada. Killefer Manufacturing Corporation, 5525 Downey Road, Los Angeles, Calif. Branches in San Francisco, Calif. and Peoria, Illinois.

Highway Machinery Trailers

Will pick up heavy machines at (not near) one job and set them down at (not near) the next job. They save time in loading and unloading and they travel at motor-truck speed.

**HIGHWAY
TRAILER CO.**

FACTORY AND GENERAL OFFICES
EDGERTON, WISCONSIN. U. S. A.



They Save Space and Time on Your Heavy Machines

Buhl

AIR COMPRESSORS

Make Bigger Profits

Because they embody up-to-the-minute features that enable them to produce compressed air at the lowest possible cost.

The Buhl Line of air compressors offers the widest possible selection of portable compressors in sizes 36, 55, 90, 100, 110, 220, and 330 cubic feet displacements per minute.

Write for Descriptive Literature

THE BUHL COMPANY

General Offices: Old Colony Bldg., Chicago, Ill.

Sales Branches in All Principal Cities



FAIRFIELD PORTABLE BELT CONVEYORS

Manufactured in lengths 20 to 60 feet
20 inches or 24 inches wide
Gasoline or electric power
Maximum capacity assured by wide troughed belt without use of side boards to cut belt edges.

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The original self-loading scrapers continue to show their ability to move large quantities of dirt with two to three men. They dig, load, haul, dump and compact the dirt as a single outfit.

They are available in three sizes— $\frac{3}{4}$ -, 1- and $1\frac{1}{2}$ -cubic yard capacities to suit your job or your tractors.

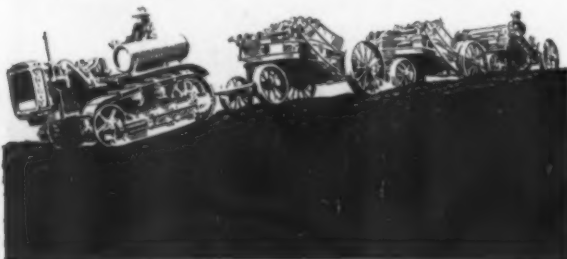
Write for these Baker Bulletins

- Bulletin No. 263—Baker Maney Scrapers ☐
- Bulletin No. 256—Baker Rotary Scrapers ☐
- Bulletin No. 270—Baker Road Maintainers ☐

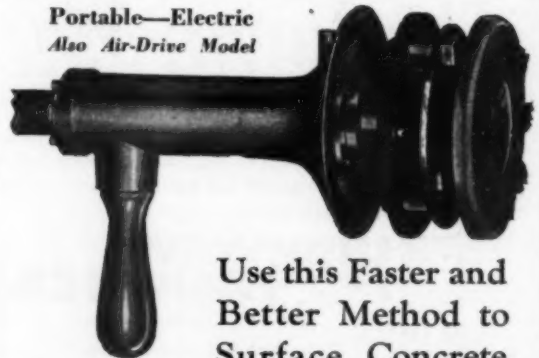
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Portable—Electric
Also Air-Drive Model



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Actual Size of the Simplex Miniature Jack

"How can I use it?"

Keep it in your tool kit. Use it for odd jobs around the house—to straighten doors, window frames and drawers, or to lift the bookcase off the rug—or use it on your desk as a paperweight—or let the little chap use it to jack up his toy truck!

"What is it?"

A combination tool and toy that's an exact reproduction of the large Simplex Screw Jacks—it's three inches high when closed—Duco-finished—with the open hand hole for safe handling.

Packed in an attractive box, it is offered you for 35c (or three for \$1.00). Postage stamps, cash or check acceptable.

The price includes postage and an unlimited guarantee that it will please you or your money will be refunded.

CONTRACTORS & ENGINEERS MONTHLY
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with simple and direct
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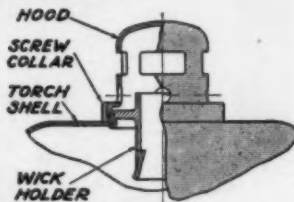


*in other words
always use the*

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PRETTY colored lanterns may get you by with cautious drivers, if you hire a watchman to keep them on the job. But it's the reckless ones who cause all the accidents. With them the use of uncertain signals, such as red lanterns, is a needless risk for you to take, especially when it is so much more costly than using TOLEDO TORCHES.

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THE TOLEDO PRESSED STEEL CO.
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No. 18-A Saw Rig

With the new "TEXROPE"
drive: all steel welded
frame and steel table top.

Write now for additional information

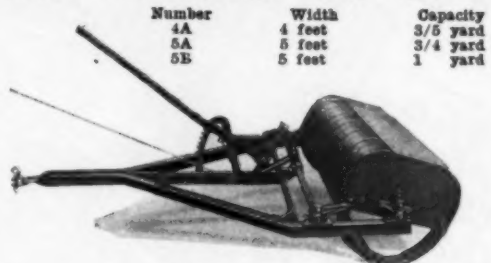
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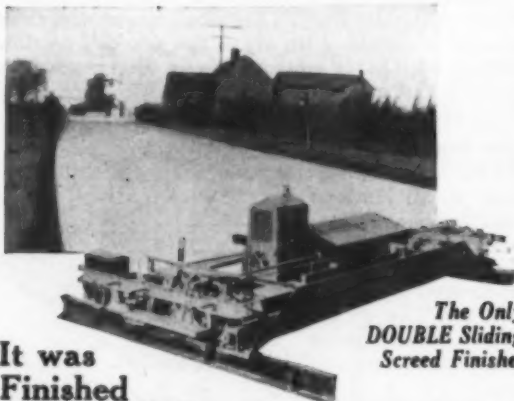


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Not a bump, not a bubble from end to end. A thoroughly compacted, load-proof pavement from top to bottom of the slab. And down in record time with lower labor costs. That is why the ORD is eating up the big and little jobs in every part of the country.

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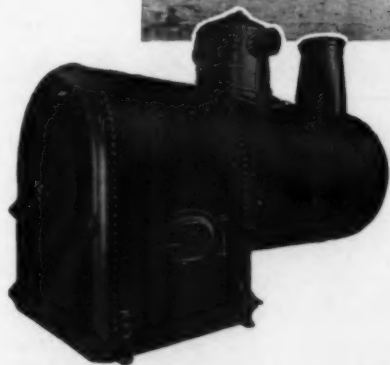
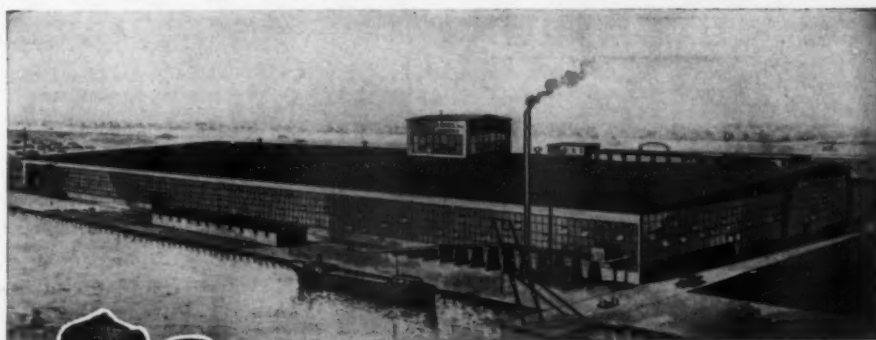
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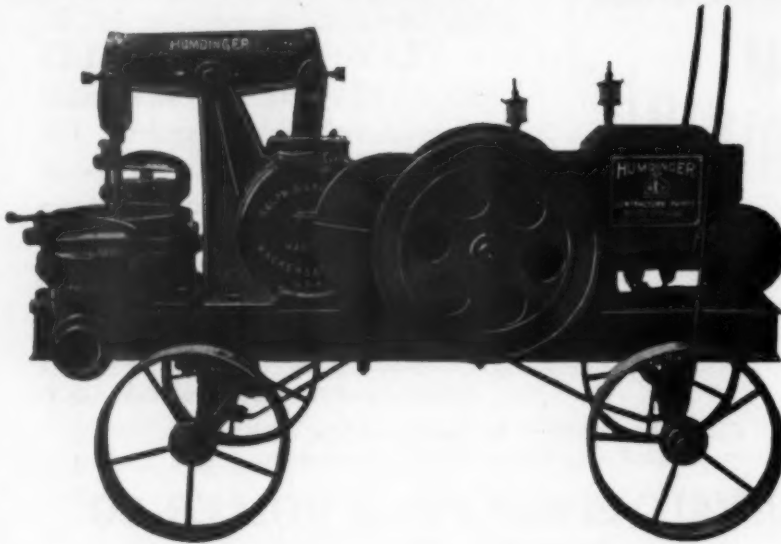
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Boosting Excavating Profits

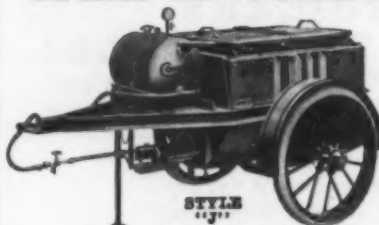
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P & H Shovels and Cranes
BARNES Pumps
ORD Concrete Finishing Machines
RED STAR Wheelbarrows
"TONCAN" Metal Culverts
CONNEAUT Hand Shovels
JONES-SUPERIOR Saw Rig
ACME Rollers and Crushers
MUNDY Hoists
DOBBIE Derricks
SCHOFIELD Excavators
CENTURY Cement Bag Cleaners
WILLIAMSPORT Wire Rope
FREEMAN Truck Turntables
Dump Wagons and Trailers
Grader Blades, Tents and Flys
Wheel and Drag Scrapers
Grading and Rooter Plows
HELTZEL Road, Sidewalk, Curb and Gutter Forms
Material Bins and Hoppers
Matstocks and R. R. Picks

Smith-Meadow Supply Company, Inc.

1629 Avenue "A" Birmingham, Ala.

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RANSOME CONCRETE MACH. CO.—Mixers and Pavers
LINK-BELT CO.—Shovels and Cranes
JOHN DEERE FLOW COMPANY—Plows and Wheelbarrows
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Complete line of Contractor's Equipment and Supplies

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Nye Hoists, Pumps, etc.
Blaw-Knox Forms, Batcher Plants, Buckets
Easton Dump Bodies, Cars and Track
Worthington Pumps and Air Compressors
Bex-Watson Dump Wagons
Red Edge Shovels and Picks
General Wheelbarrows
Carey Elastite Expansion Joint
M. & M. Form Clamps
Beebe Bros. All Steel Hand Hoists

C. B. DAVIS ENGINEERING CO.

Brown Marx Bldg. Birmingham, Ala.

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ALDRICH—Power Driven Pumps
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LO-HED—Electric Hoists
INDUSTRIAL BROWNHOIST—Locomotive Cranes
CLEVELAND—Cranes

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EMPIRE FLOW WORKS—Plows
EUCLID CRANE & HOIST CO.—Crawler-Type Dump Wagon, Power Scrapers
ATLAS SCRAPER CO.—Rotary Wheel-Type Scrapers & Fresno's

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Contractors' Equipment

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SIDNEY Wheelers, Drags, Plows
RANSOME Concrete Mixers, Pavers
OBTON Cranes, Shovels, Draglines
AUSTIN Trenching Machines
C. H. & E. Saw Rigs, Hoists, Pumps
FARQUHAR Engines, Boilers, Sawmills

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Contractors' Equipment

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CLEVELAND TRACTOR CO.—Cletrae Tractors
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C. S. JOHNSON Bins and Weighing Hoppers
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DOBBIE FOUNDRY & MACHINE CO.—Derricks
ORR & SEMBOWER—Concrete Mixers & Hoists
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ALABAMA
DOMESTIC—Pumps and Hoists
LANSHAW COMPANY—Barrows and Trucks
AMERICAN ROLLING MILLS CO.—"Armo" Iron
WYOMING SHOVEL CO.—Red Edge Shovels, Scoops
LINK-BELT CO.—Crawler Cranes, Shovels, Loaders
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BAKER "Baker Maney" Self-Loading Scrapers
BYERS Full-Revolving Shovels and Cranes
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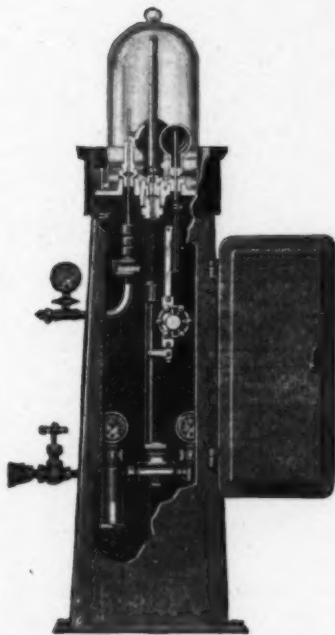
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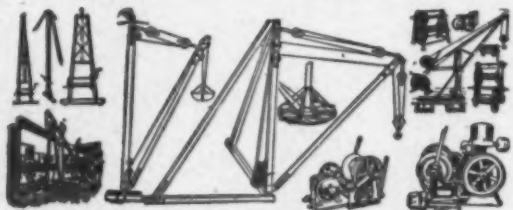


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Before me, a Notary Public, in and for the State and County aforesaid, personally appeared EDGAR J. BUTTENHEIM, who, having been duly sworn according to law, deposes and says that he is the President of the Buttenheim-Dix Pub. Corp., Publishers of CONTRACTORS AND ENGINEERS MONTHLY and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:
Publisher, BUTTENHEIM-DIX PUB. CORP., 443 4th Ave., N. Y. C.
Editor, THEODORE R. KENDALL
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2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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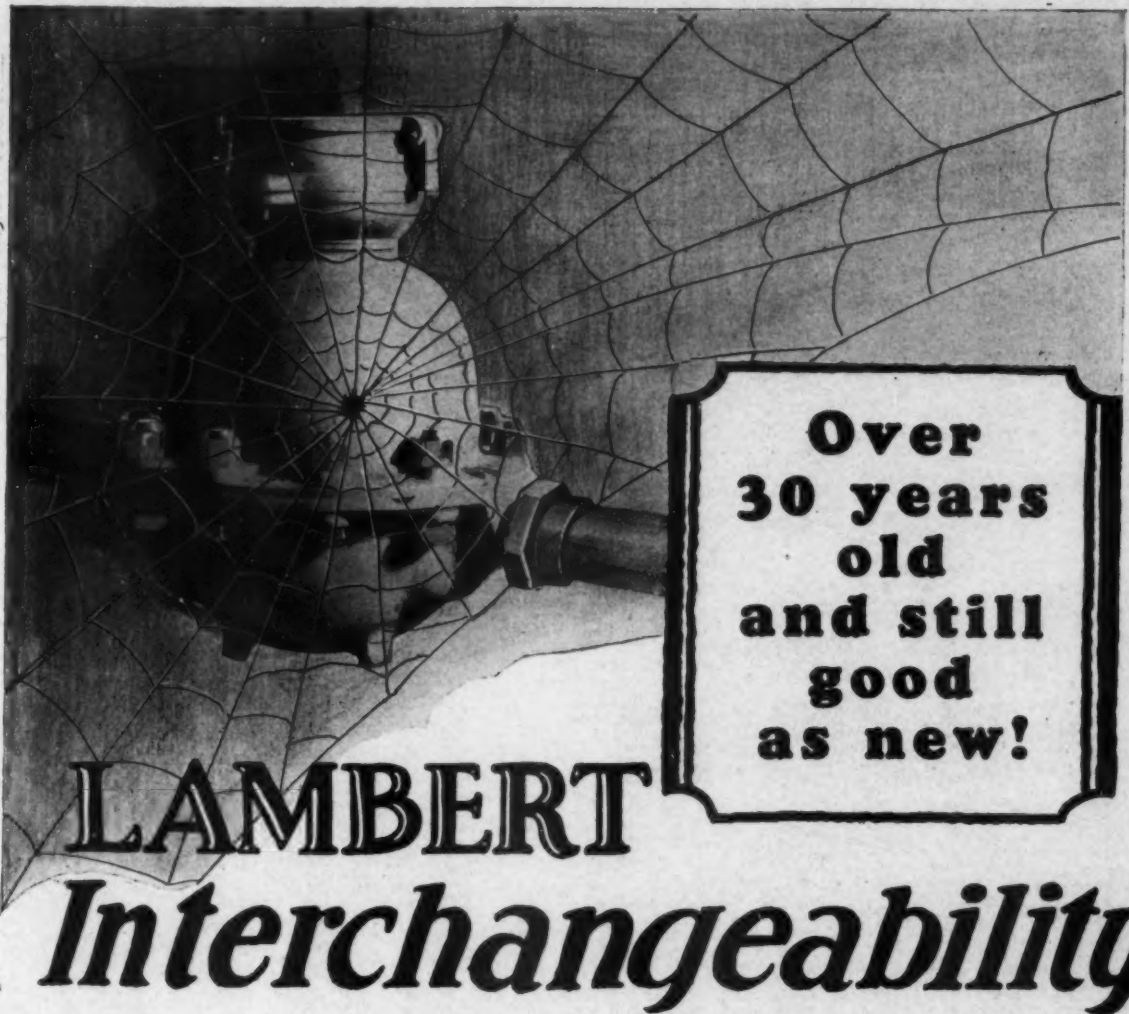
Sworn to and subscribed before me

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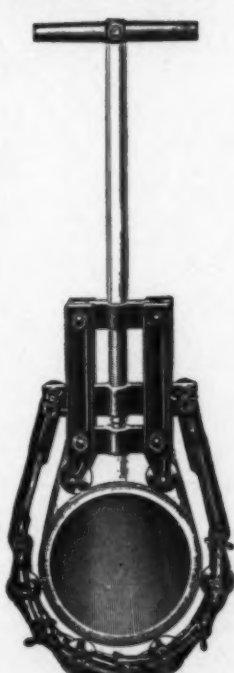
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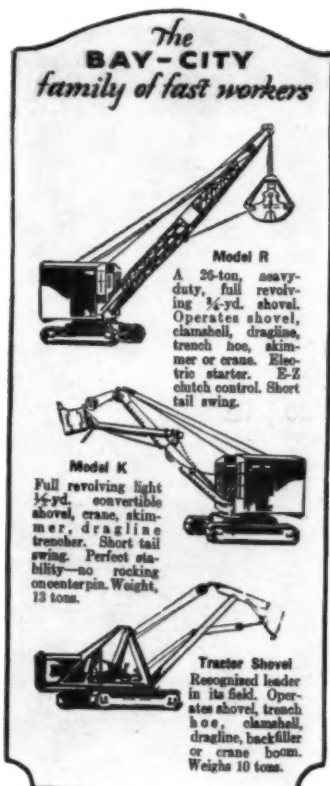
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Praley, Lawrence V.	109			Penn Machy. Co., Inc., H. O.	111		
French Co., A. W.	96			Penn Machy. Co., Inc., H. O.	111		
Fuchs Equipment Co.	110			Penn Machy. Co., Inc., H. O.	111		
Funkhouser Equipment Co.	109			Penn Machy. Co., Inc., H. O.	111		
				Penn Machy. Co., Inc., H. O.	111		
Garfield & Company	101			Penn Machy. Co., Inc., H. O.	111		
Garthhouse Bros.	100			Penn Machy. Co., Inc., H. O.	111		
Garst Manufacturing Co.	81			Penn Machy. Co., Inc., H. O.	111		
Gartch Co., W. W.	120			Penn Machy. Co., Inc., H. O.	111		
Geisbeek Engr. Co.	121			Penn Machy. Co., Inc., H. O.	111		
General Equipment Co.	121			Penn Machy. Co., Inc., H. O.	111		
General Equip. Machy. Co., Inc.	103			Penn Machy. Co., Inc., H. O.	111		
General Machinery	121			Penn Machy. Co., Inc., H. O.	111		
				Penn Machy. Co., Inc., H. O.	111		
Garfield & Company	101			Penn Machy. Co., Inc., H. O.	111		
Garthhouse Bros.	100			Penn Machy. Co., Inc., H. O.	111		
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Geisbeek Engr. Co.	121			Penn Machy. Co., Inc., H. O.	111		
General Equipment Co.	121			Penn Machy. Co., Inc., H. O.	111		
General Equip. Machy. Co., Inc.	103			Penn Machy. Co., Inc., H. O.	111		
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The picture shows it equipped with a standard 30-ft. crane boom and the new Owen type K, 1/2-yd. bucket. Note the large diameter rotating base and the unit-cast manganese car body.

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Model "K" has the shortest tail swing (7 ft.) of any full revolving shovel. It has a McCormick-Deering power unit, roller or ball bearings for all operations, three lever hand control, independent friction clutches for each crawler, no jaw clutches, no machinery below base.

Complete story in Bulletin K-1. Send for it.

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